CHAPTER - II

REVIEW OF RELATED LITERATURE

A summary of the writings of recognized authorities and of previous research provides evidence that the researcher is familiar with what is already known and what is still unknown and untested. Since effective research is based upon past knowledge, this helps to eliminate the duplication of what has been done, and provides useful hypotheses and helpful suggestions for significant investigation.

Capitalizing on the reviews of expert researchers can be fruitful in providing helpful ideas and suggestions. Keeping this in mind the research scholar made an attempt to go through the related literatures in libraries of Amravati University, Amravati, Degree College of Physical Education, Amravati, Lord Baden Powell Scout Library, Amravati, Chandrasekhar Agashe College of Physical Education, Pune and the library at Laxmibai National Institute of Physical Education, Gwalior.

Hardly any discovery is possible without having use of knowledge gained by others. Experience of others, by gone or contemporary decidedly acts as the milestone that properly guide those who dare to follow and step in their foot prints. The present experimenter is no exception to it. Like others he has learned much from the experience of others. When he scanned the literature and research work, published so far, for here and abroad, on the allied field and physical education and sports. Extensive studies regarding exercise science, different exercise programme and their developmental, hygienic, therapeutic and other values use of bir
muscle activities and sports culture is available in research journals. But comparatively very few studies are reported regarding Kho-Kt
sports, the relative studies found from various sources, which the scholar has come across, are cited below.

Needless to say, it is absolutely necessary to acknowledge without hesitation the debts of all the aforesaid research. Worker for the benefit this investigator derived from their research methods and their valued results to decide this line of approach towards the solution of the problem in mind. It is now his Job to weld all these sources of information into effective action and than to reach effective end outcomes. In short there are very few research work that take in to account team games as their province and those that are available are in majority, applying measures of achievements and skills alone required in one game or the other. The constantly felt need is of more predictive measures of performance ability in team games. And such more than this one is the need of studies that would simultaneously comprehensively deal with as possible aspect of that performance ability prerequisite for a particular game.

George Highmore ¹ worked on the "Factorial Analysis of Athletics Ability the research was limited to a study of the physical nature of Athletic ability. Tests conformed to the actual physical movements employed in athletics. The rater the grace of athletics performance on a five-point scale. It was found that age, weight and height played negligible part in the problem; and it was seen that intelligence does not correlate with athletic ability. Further according to wings scores a sense of musical rhythm does not correlate with athletics rhythm. The factorial results suggested that three tests should be included in any regression equation. These are (I) the fifty-

¹ George Highmore; "Factorial Analysis of athletic ability", Research Quarterly, 27: 1. (March, 1956); PP- 1-11.
yard sprint. (II) The medicine ball put and (III) The standing broad jump.

Theresa Anderson and C. H. McCloy 2 undertook to measure sports ability in tennis, Basketball, Swimming, Volleyball and Softball. The subjects were 155 girls in grades 10 to 12. The subjects were rated in the sports skills on seven-category scale. They were also rated on sports intelligence and poise. In an analysis of the results of this study; it was seen that "The variables; most highly correlated with sports ability Viz Power, Motor ability, agility, and ability to make quick and an adaptive motor response measured by sargent jump; Brace Test and the Johnson test; cozens dodging run, Turnstone's spatial relationship and the McCloy's Blocks tests respectively.

Elmer A. Cross; Donald C. Greisel and Alan Stull 3 administered two tests of motor educability (Iowa Brace and Metheny Revision of Johnson Test) and a strength test (McCloy's General strength Quotient) to 56 college students during the first week of the eight week session. During the next six weeks wrestling instruction was given to the subjects. In the final week three competent Judges assessed the wrestling ability of the subjects through the use of tournaments and a scoring card. The following conclusion were


3 Elmer A. Gross; Greisel C. & Donald Alan Stull, "Relationship Between Two Motor Educability Test; And Wrestling Ability After Eight Week Instruction", Research Quarterly, 27:4. (December. 1956); p.-395.
drawn; (i) The Iowa Brace and metheny Revision tests of "motor Educability," were not measure of the same ability; (ii) A battery including two tests of motor educability and strength Test was both impractical and brittle worth in predicting individual learning ability of college students in wrestling.

In order to determine whether balance is a factor in ability and speed in swimming; Elmer A. Gross and Hugh L. Thompson 4 Administered the Bass test of dynamic balance and accordingly classified 39 students as having "good" dynamic balance and 39 students as having "poor" dynamic balance. A critical ratio of 12:30 was obtained between the mean scores of the two groups on swimming ability as rated by three judges. This 't' ratio was significant at the .01 percent level of confidence and indicated that balance may be an important factor in swimming ability.

Louis F. Koller; 5 studied the relationship of "quickness of bodily movement" to success in athletics. Measurements of "total body quickness" were taken of 359 athletics and of 277 Non-Athletics (Men and Boys) in two high schools and in the university of Minnesota. Athletics success was determined by two methods of rating; one of which was based upon performance and the other upon estimates by coaches and physical education teachers. From the finding of this investigation, following conclusions were drawn:

4 Elmer A. Gross; and Thompson Hugh L., "Relationship of Dynamic Balance To Speed And To Ability In Swimming", Research Quarterly, 28: 4. (December, 1957); p- 342.

(i) There is a positive relationship between the ability to move the body quickly and success in athletics activities.

(ii) The requirements in the quickness of bodily movements are not the same for all sports.

(iii) A person with relatively slow total body reaction time has a better chance of attaining success in the more individual activities such as Gymnastics; Swimming and Wrestling than in those sports in which he is required to react to rapidly changing condition and to the movements of several team mates and opponents; such as is found in baseball, basketball, football and the like. Men who are not quick enough to achieve proficiency and success in this highly competitive team game might be guided in to the more individual type of sports and possibly become outstanding performers. The author; at the end; suggested that further study along these lines might be made with a view toward establishing standards that could be used as criteria for successful participation; and for diagnosis.

He also suggested that the relationship between quickness and the various positions or events of a given sports be studied.

Peter W. Everett ⁶ has made a comprehensive study of the problem of predicting baseball ability. He administered five tests to thirty subjects and finally established a battery of three tests. The regression equation to be used for prediction of baseball ability is

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“Criterion in T. score = 0.92. Sargent Jump. Ability (C.M.)- 0.80 “S” Test (Score) - 0.23 Block Test (Score) + 16.19”.

Greenberg 7 studied the effect of two interval training programme on running ability. The experiment at group of thirty subjects each and a control group of twenty-four subjects were employed in the training programme, which was conducted three times weekly for seven weeks. Both the groups trained over a distance 110, 220 and 330 years. In one group speed running was held constant while the number of repetition of each distance was increased. The second group ran a fixed number of repetitions at progressive faster speed. Both experimental groups, However no significant difference in improvement of running ability over 440 yds distance was found between the experimental groups.

Keith 8 took thirty untrained college males participated in a 10 weeks study comparing the effect of three different types of training on 800-meter run performance. All subjects were engaged in 20-30 minutes of endurance running three times a week. In addition to the endurance running Subjects participated in hill training, sprint training, or weight training three days a week. The hill a training consisted of repeated 30 seconds sprints up an 8% graded hill. Sprint

7 Franklin; R. Greenberg; “The Effect Of Two Interval Training Programme On Running Ability”, Completed Research In Health, Physical Education And Research, 8 (1966); p.83.

8 Miller; Douglas Keith. “A comparison and the effect of hill training and weight training and sprint training on 800 meter run performance” Dissertation Abstracts International, 53: 7. (January 1994); 2991 A
training included distance ranging from 50 to 300 meters with 2-3 minutes recovery periods between sprints. The weight training included clean, squats, calf raise, leg-extension and leg-curls. Each exercise was performed in 3 set of 8-10 R.M.

Only the hill and sprint groups showed significant difference between pretest and post on test 800 meter run performance. It was concluded that concurrent weight on endurance training is not an effective way to improve 800 meters run performance of untrained subjects.

Group’s comparison revealed that both hill and sprint training resulted in significantly greater charges than weight training (P<. 02). Expectation of This Study: Sprint training significantly improved leg Flexion torque at slow and fast speed. ANCOVA results, however failed to establish, significant differences between training groups on the adjusted posttest is kinetic strength measure.

Hill and sprint training resulted in nearly identical changes in the parameters tested. It was concluded that they are effective training methods for imprinting 800 meter run performance in untrained subjects endurance capacity, anaerobic capacity and percent body fat were significantly correlated to 800 meter run performance (P< 0.01) Level.

Shymal Mazumdar 9 studied the changes in motor fitness component and playing ability resulting among soccer players at two

stages of physical education and conditioning programme. She concluded that: (i) During the first stage of physical education and conditioning programme speed, maximum leg strength, agility and playing ability were improved; (ii) During second stage only maximum leg strength and agility improved significantly; (iii) The break in between the stages of training diminishes the improvement of playing ability, maximum leg strength and agility; the speed was unaffected and (iv) The total years of physical education and conditioning programme was proved to be of value in improving motor-fitness component and playing ability.

Jeffrey T. Spielman; 10 has conducted his study on the inference of Isotonic and Isokinetic weight training on Jumping proficiency. Of college men (N-28) Isotonic and Isokinetic training were assigned to the two experimental groups with the third groups serving as control. Training for experimental groups consisted of isotonic circuit training on a universal weight medicine. Data analysis includes reliability experienced a higher level of performance (8.7 percent 7.3 Percent) and reproducibility assessment and ANOVA to determine whether significance mean changes had occurred between the groups. Turkey’s W-Procedure was used to identify the source of significant (P.05) difference from those of the controls. Although there was no significant difference between mean performances of the two groups The Isotonic group participated in training programs, similar relative improvement took place.

10 Jeffery. T. Spielman; “The Influence of Isotonic, And Isokinetic Exercise on Vertical Jumping Proficiency”, Completed Research In Health, Physical Education And Recreation. 21: (1972); P-212.
Brownholtz, 11 studied the effect of a physical education soccer class and a wrestling class upon static balance and flexibility. He used on experimental group of college subjects and other control groups were administered pre and post-tests on the dynamometer for static balance and six measurements of flexibility with the Leighton Flexometer. Wrestling caused a significant improvement in a right and left ankle flexibility and a significant decrease in the left wrist flexibility, soccer caused significant increase in right wrist flexibility and static balance was improved significantly in all groups including the controls. The control group also decreased significantly in hip flexibility.

Mendez 12 investigated the relative effectiveness of two training programme i.e. progressive resistance exercise and sprint training in the improvement of sprinting velocity was determined. Two random groups of subjects (N=31) were formed: group one (N=16) participated in weight training programme using the universal machine progressive resistance exercise. While group 11 (N=15) participated in sprint training programme. Subject were tested pre and post test on 60 yards dash, each time allowing one practice run by each student.


The duration of the experiment was seven weeks, which include 20 periods of exercise. ANCOVA was used to determine significance of differences between the two groups (P.05) No. Significant differences were detected between the weight training and sprint-training program. Both training programmers showed small but non-significant decreases but significant decreases in mean time for sprinting 60 yards.

Lawman 13 investigated the effect of toe training on the development of certain bio-mechanical factors of sprinting speed i.e. stride length; stride frequency and dynamic range of motion of the femoral shaft. All subjects (N=25) were divided randomly in to experimental group and central group. Training programme was established thrice a week for a six-week periods. After six weeks post test conducted for investigation showed that (i) Subjects who were engaged in toe training significantly. Increased speed. (ii) Control group did not significantly increase in speed and the only identified variables, which showed a significant positive change was flexion of the femoral shaft; (iii) Total sample (N-25) significantly increased speed dynamic range of motion and Femoral Flexion.

Helixon 14 studied the effect of heavy resistance training programme upon running and jumping performance of first year high school trackmen. Twenty-four subjects were randomly assigned either to an experimental group which engaged in weight training five days a week for six week or to a control group which engaged in no weight training. Result showed no significant difference between the experimental and control group at the conclusion of the experiment.

Myere 15 examined and comprised the effect of training highly conditioned varsity soccer players on running circuits of 1.86 degree down hill and zero degree during a competitive season. The specific questions with which this study was concerned were the effect of down hill and level circuits on varsity soccer players. Maximum running speed, Stride frequency and leg strength After a five weeks of training the study concluded that: (1) The down hill menthol's of training significantly improved the stride length of the Varsity soccer players; (2) The down hill menthol's of training can be effectively used as a supplementary Sprint training method and (3) The down hill menthol's of training did not significantly increase running speed And stride frequency.


Penny 16 studied the training programme consisted of forty minutes session per week for six weeks. Result indicated that: (1) A training programme of resistance running alone or supplemented by weight training, isometric contraction and repetitive sprinting would significantly increases speed, leg strength, power, muscular endurance, and agility; (2) Resistance running supplemented by isotonic leg exercises; isotonic contraction and repetitive sprinting will not improve standing broad Jump ability as significantly as speed, leg strength, muscular endurance, and agility and (3) Orthogonal comparison revealed upward trends in improvement of all variables during the six-week training programme.

Kennison 17 and James made a study on the effects of four training programme on the accuracy in motor performance. One group practiced with a regulation basketball another group with regulation ball and had supplemental isometric exercise; the third used the weighted ball plus isometric exercise. After a present and final list researcher concluded that shooting accuracy improved significantly for the groups using the weighted ball rather than the isometric exercise interaction. No significant gains were made in passing accuracy.


17 Kennison and E. James; "The Effect of Four Training. Programme on the Acquisition of Speed and Accuracy in Motor Performance" Completed Research in health, physical Education and Recreation 9 (1967); 59.
In a study Hess\textsuperscript{18} randomly divided the soccer team member (17) into a control group and an experimental group that used progressive resistance exercises to develop hip flexion and knee extension strength for 7 weeks. All subjects were proficient in kicking a stationary ball with the instep. All subjects had pre-post test for kicking distance (Average of 5 longest of 20 kicks.) and leg strength (sum of hip flexion and knee extension strength).

Analysis of Co-Variance showed that the experimental group improved significantly more in kicking distance at the 0.01 level. The "t" ratio showed a significant increase in leg strength at the 0.01 level for the experimental groups but not for the control group.

Dintiman\textsuperscript{19} conducted a study to find out effect upon the development of muscular strength and endurance. Forty-nine male college students were tested before and after seven weeks of weight training on eleven calisthenics and barbell exercises requiring muscular strength and endurance.

Upper arm girth measurements were taken with elbow flexed forcefully. Subjects were assigned randomly to a weight group (25) training with heavy weight and few repetitions; and a rap group (24) using lifting weight and more repetitions. Both groups made substantial gaits in each test. The weight group had greater average in seven of the twelve tests with three significant, beyond the 0.02 level.

\textsuperscript{18} Robert C. Hess, \textit{The Effect Of Weight Training Programme On Soccer Kicking For Distance}, Completed Research in Health, Physical Education Recreation, 8 (1966); p- 97.

\textsuperscript{19} George B. Dintiman; "Effect of Various Training Programme on Running Speed." Research Quarterly 35:4. (Dec.1964); p- 456.
of confidence. The rap group was significantly superior in none of the tests.

According to Kocher's study, there was significant change in two-hand coordination between PEIG and ETG after the yogic practices as compared with their initial scores in terms of total and contact error time. In this study he also constructed a scale for measurement of attitude towards yoga. Yogic practices are claimed to reduce psycho physiological dis-equilibrium and stabilize the mechanism. In the face of external and internal stimuli the result of this study seems to be in favors of the claims made for the effects of yogic practices.

Davis attempted to analyze the effects of training and conditioning for the 200-yard crawl stroke events upon the physical condition of non-varsity swimmers. Selected measures of cardiovascular condition general physical fitness, gross strength, motor

20 H.C. Kocher, "Construction of scale for the measurement of "attitude towards yoga", Yoga-Mimamsa, 15:3. (1972); p-51

fitness, strength of the muscle groups primarily utilized in swimming the crawl stroke, and the strength decrements of the muscles were taken before and after the experimental period in order to evaluate the effect of this period. In swimming the 200 yards crawl stroke event. And the various selected tests were studied. As a result of the training and conditioning programmers' scores on test batteries used to measure physical fitness, motor fitness and gross strength improved significantly. No significant difference was obtained for cardiovascular condition. Further no co-efficient of correlation was obtained that was sufficiently high to be of value for prediction of swimming time.

Ibrahim 22 conducted a study to determine the relative effect of an up hill sprint of three degrees (U H) a downhill sprint of two degrees (D H). The combination of an up hill and down hill sprint of the three degrees and two degrees (U D) and a zero level sprint (L) upon maximum speed over a distance of a 30 meter dash; flying start over a distance of 20 meter dash stride length, stride frequency and sprinting technique and to observe the relationship between the improvement of maximum speed and increasing stride length; stride frequency and sprinting technique.

Fifty untrained male fresh man volunteer students enrolled in the Sport Education College at Baghdad University Baghdad, Iraq. Were randomly selected from those with the criteria to serve as subjects for the study The Subjects were the assigned randomly to one of four treatment groups and control group. Consisting of ten

subjects each Pre test were given in flying start maximum speed, stride length, and stride frequency. Sprinting technique, age, height body weight, leg length and percent body fat. Post test were also given after an eight-week progressive repetition training programme.

A multiple regression technique was used to determine if any significant relationship values existed between maximum speeds, stride length, and stride frequency and the selected Anthropometrics measurements mentioned above.

No significant differences were found between groups for flying start. Maximum speed, stride length stride frequency, and sprinting technique. Significant differences took place across time in flying start; maximum speed, stride length, and sprinting techniques. The four groups who were involved in training programme improved significantly maximum speed stride length and sprinting technique from the pre test to post test.

Steric and Mary 23 conducted 4 activity courses on the development and maintenance of physical fitness on college women. They proved body dynamics; body conditioning and movement fundamentals were equally effective in developing and maintaining abdominal strength and endurance. Body conditioning and badminton were equally superior to other activities in developing and maintaining arm and leg strength and endurance as measured by modified pull-ups and jump.

23 J.R.Steric and Mary, “The relative effectiveness of four activity courses on the development and maintenance fitness and college freshman, women” Completed Research In Health, Physical Education and Recreation,8;(1964);p.-65.
Rao and Luthra \(^{24}\) conducted a study on 36 adolescent males who were divided into three groups of twelve each. Exercise program of positive breath holding and negative breath holding were assigned random two of the three groups and the third serving as control. Positive breath holding group practiced Kumbhaka, i.e. holding breath after deep, slow and full inspiration and negative breath holding group practiced Kumbhaka after slow expiration. Aerobic Capacity was indirectly measured by the distance covered by the subject in Cooper’s twelve minute run/walk test and Anaerobic Capacity was measured by the explosive work done by the subjects in leaping six stairs in two steps covering vertical height of 0.81 meters as propounded by Margaia-kalaman power Test. The study proved that practice of Pranayama with positive breath holding increases aerobic capacity and practice of pranayama with negative breath holding increases anaerobic capacity. Significance was that the injured sports man unable to run can keep in condition by practicing pranayama with kumbhakas.

Uppal and Singh \(^{25}\) studied the effect of 8 weeks participation in physical education and conditioning programmers on flexibility. Twenty-eight men students admitted to the first year bachelor of physical education class of Laxmibai National College of Physical Education, Gwalior, were selected at random as subjects for

\(^{24}\) V.S.S.M.Rao. Rameshpal luthra, \textit{"Effect of breath holding on aerobic and anaerobic capacities,"} Yoga-Mimamsa, 24:29 October (1985); p.-41

the study. The subjects were administrated the following flexibility tests.

1. Sit and reach test.
2. Standing bobbing test.
3. Shoulder flexibility test

The initial and final tests were administered. He concluded that regular participation in programme of physical education and conditioning of eight weeks duration effectively improves flexibility of the hip, trunk, shoulder and spine. As measured by sit and reach test. Standing bobbing test, shoulder flexibility test and spine flexibility test respectively.

Williford et.al. 26 evaluated ten healthy untrained females (age twenty three years) to determine the effects of ten weeks of aerobic dance training of plasmalipid and lipoprotein levels, cardio-respiratory function and body composition. A control group of eight untrained females (mean age twenty six years) underwent the same evaluation procedures as the training group. Fasting blood samples, collected pre and post training, were arranged for triglycerides, total cholesterol, high density lipoprotein cholesterol Maximal tread mill test any body composition was determined by hydrostatic weighing methods. Triglyceride, Low density Lipoprotein did not significantly

greater (F = .05) than in the control group for maximum oxygen consumption (VO₂ max) (12% Vs 2%) and time in a continuous grade incriminated treadmill test (11% to 20%). Body composition did not change significantly in either group. It was concluded that ten weeks of aerobic dance training can significantly improve cardiovascular fitness independent of changes in serum lipids, lipoproteins or body composition.

Gregory 27 conducted research on untrained college males who were randomly assigned to one of the two experimental groups and a control group. He took four, seven and seven subjects in the control, interval running and continuous running groups respectively. Training consisted of jogging or running on a quarter mile track for a distance of two miles, five days a week and for the period of six weeks. The intensity of run was controlled by keeping the pulse count at 162 beats and 174 beats per minute, for continuous and interval groups respectively. It was concluded that continuous and interval-training method were equally effective in developing aerobic capacity when the same total work is performed.

Dupper Michel Alfred 28 studied the effect of an aerobic program on the physiological, cognitive and behavioral functioning often-institutionalized retarded children were studied. The subjects, aged twelve to eighteen were randomly divided into experimental


28 Dupper Michel Alfred, “The Effects of Ten Week Aerobic Exercise Program on Physiological, Cognitive and Children”, Dissertation Abstracts International, 47:4 (October 1986); 1235.A
(Group I) treatment and control (Group II) groups. Group I participated in a 30-minute aerobic exercise program three times per week for ten weeks. Group II spent the same amount of time participating in physical education motor skills class. All subjects were evaluated at a beginning and end of the ten week period with the Durnin and Rahaman Skin fold estimate of body fat, the skubic-Hodgkins slip test, 600 yard run/walk, Goal attainment scale, and vinel and adaptive behaviors scales socialization. A post test revealed a significant improvement among the experimental treatment group within the areas and body fat composition and cardiovascular efficiency. Cognitive and behavioral functioning did not improve significantly as a result of the treatment.

Grayston Judith Jee 29 studied the effect of an eight-week water aerobics program on selected physiological measurements of 54 female participants aged eighteen to twenty five years. The previously secondary subjects were divided into control group (N=29) and on experimental group participated in a progressive water aerobic program three times per week for eight weeks. Analysis of covariance was used to determine if any significant difference between the two groups existed on the variables. The result of this study indicated a significant difference at the .05 level in resting heart rate between the groups. No differences were found in either systolic or diastolic

29 Grayston Judith Jec, "The Effect of an Eight Week Water Aerobics Program an Selected Physiological Measurements of Female Participants," Dissertation Abstracts International, 51:7 (January 1991); 2312-A
pressure, body weight or percentage of body fat. It was concluded that water aerobics can be sufficient intensity to increase fitness if young, sedentary individuals.

Kirby 30 studied the effect of various exercise programs involving different amount of exercise on the development of certain component of physical fitness. The Harvard step test and J.C.R. test were administered to 140 college men before and after a 6-week training programme meeting three times a week. The five exercise programme consisted of class activity plus one isometric exercise, the same plus running in the place, the same plus vertical jumping. The same plus push-ups and entirely improved significantly on the Harvard step test with no differences between groups. The JCR composite score showed a significant negative linear regression with the number of exercises. The major factor in conditioning was the intensity of exercise, even in one exercise for a few seconds rather than the time spent, number of repetitions and/or number of exercise in the programme.

Churdar 31 studied and effect of four different frequencies of a specific exercise programme on physical fitness. The beginning

30 Kirby, Ronald f. "The Effect Of Various Exercise Program Involving Different Amounts Of Exercise On The Development Of Certain Components Of Physical Fitness", (Completed Research In Health, Physical Education And Recreation, 9(1967); p-169.

level of physical fitness of subjects in one control and four experimental groups was achieved by participating RCAF 5 BX plan two days per week for a 19-week period prior to the experimental period.

Physical fitness was measured every three weeks during the 12-week experimental period by a modified step-up test. Results indicated significant improvement in physical fitness in the groups that engaged in the exercise programme 2-days, 3 days and 6 days per week in addition to going all out every 3 weeks. The control group had a slight decline in physical fitness but was almost able to maintain its level by going all out every three weeks.

Agli 32 conducted a study to determine the effect of a selected skills programme on physical fitness. For this study the subject were 38 boys and 34 girls in three grade-six classes. All were given Kirchner's physical fitness test for elementary school children before and after five weeks of volleyball, gymnastics or rhythms, and the data were analyzed with analysis of covariance. The volleyball and gymnastics groups showed mean significant increases beyond .01 levels; the class engaged in rhythms has a mean increase significant between the .05 and .01 levels. The change in the volleyball group was significant (05) greater than that of the gymnastics group and even more significantly (01) above that of the rhythms group. The gymnastics group was significantly (.05) greater than that for the rhythms programme.

32 Agli, James J.;“A Study To Determine The Effect Of A Selected Skills Program On Physical Fitness”. (Completed Research In Health, Physical Education And Recreation, 6(1964); p-88.
Court 33 conducted a comparison of calisthenics programme and an obstacle programme as methods of developing fitness in seventh and eighth grade boys. The Washington state physical Fitness Test was administered to 48 boys in grades VII and VIII before and after a 2-month experimental period during which half the boys had daily calisthenics and other half ran an obstacle course daily. The boys were selected from physical education classes at Tillicum Junior High School in Bellevue, Washington. Both programs resulted in significant within group changes in arm and shoulder strength and overall fitness. The group running the obstacle course showed a significant gain in explosive leg power. Neither programme produced significant gains in agility, endurance or flexibility. While studying the effect of three types of physical education programme on physical fitness improvement of high school girls, agid1 found that each programme developed physical fitness as well as the other two in at least four of the six measures used.

Ball 34 conducted a study for the four methods of developing physical fitness in junior high school girls. Evangaline and Cureton matched the girls in Searcy Junior High School, Searcy, Arkansas, into four groups on the basis of the motor fitness test for high school girls. The four methods compared were specific calisthenics, isometric exercises, rope jumping, and the regular

33 Court, Reginald D. “A Comparison Of A Calisthenics Program And An Obstacle Course Program As Method Of Developing Fitness In Seventh And Eighth Order Boys”, Completed Research In Health, Physical Education And Recreation, 9(1967); p. -128.

34 Ball, Florence J. “A Comparison Of Four Method Of Developing Physical Fitness In Junior High School Girls” (Completed Research In Health, Physical Education And Recreation, 9:(1967); p.- 42.
physical education programme. After three months, the motor fitness test was repeated. All groups gained significantly at the .05 level, with the greatest improvement resulting from the calisthenics programme.

Logsdon conducted a study for the comparison of two methods of developing physical fitness in fourth and fifth grade girls. In the study two methods of augmenting the physical fitness level of fourth and fifth grade girls were studies. One programme used calisthenics exercise while the other stressed basic skills. The purpose was to show how the practice of basic skills could influence physical fitness while increasing the performance level of these skills.

Ross studied the changes in physical fitness of girls after two semesters of physical education. Test item from the Iowa Motor Fitness test and the AAHPER Youth Fitness Test were administered to junior and senior high school girls before and after the semesters of physical education and after period with no formal physical education. Significant gains occurred in abdominal strength, power, coordination, flexibility and speed, during the semesters of physical education, but a significant loss in physical fitness followed the period of non-participation.

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35 Logsdon, Bette Jean. "A Comparison Of Two Method Of Developing Physical Fitness In Fourth And Fifth Grade Girls", Completed Research In Health Physical Education And Recreation, 5: (1963); p-62.

36 Ross, Jimmy L.; "The Changes In Physical Fitness Of Girls After Two Semester Of Physical Education", Completed Research In Health Physical Education And Recreation, 8: (1966); p- 61.
While studying the effect of a unit in apparatus instruction on selected elements of physical fitness of high school girls, Glosup18 found that apparatus instruction, regardless of the amount of apparatus skill developed, is effective in increasing general physical fitness, and specifically, endurance, arm and shoulder and abdominal strength.

Smith 37 compared the effects of six-week aerobic dances with the effects of a six-week aerobic jogging programme on the cardio-vascular efficiency and percents of body fat, in post-pubescent girls. The subjects were divided into three groups – dancer, jogger and control. The subjects were pre-tested and post-tested. Results of the study indicated that six-week programme of jogging increased the cardio-vascular efficiency and reduced percentage of body fat. Results also indicated no significant differences in the effect of the two programs.

Sutherland 38 undertook a study on the circuit training as a means of developing physical fitness in first and second grade boys and girls. The test was conducted on experimental group of 45 boys and girls in grade 1 and 2 had circuit training plus free-play during

37 Smith Haween. “The Effect Of A Six Week Aerobic Dance And Folk Dance Program Vs The Effect Of A Six Week Aerobic Jogging Programme On The Cardio-Vascular Efficiency And Percent Of Body Fat”. Dissertation Abstract International, 40: (September 1979); 1344-A

38 Sutherland, Donald B. “The Study Of Circuit Training As A Means Of Developing Physical Fitness In First And Second Grade Boys And Girls”, Completed Research In Health Physical Education And Recreation, 9:(1967); p-127.
recess for 12 weeks and a control group of 44 had free-play. Comparison of fitness test data before and after the period showed mean increases for the experimental group on all items and mean increases from the control group on all items except the 30-yard at the .01 level.

Coker 39 attempted to find out the selected pre-activity calisthenics programme and effects upon the physical fitness of the college-male. A 4-item battery consisting of 2-minute sit-ups, pull-ups, 60-sec. squat thrusts, and a 300-yard shuttle run measured the effects. None of the programs improved fitness significantly and there were no significant differences among them.

Trahan 40 selected forty female subjects between the age of 17 and 37 to determine and compare the effects of two kinds of conditioning programme on nine fat deposit sites, i.e., biceps, triceps, forearm, scapula, fifth rib, waist, abdomen, inner thigh and knee. The subjects participated in the exercise programme, three times per week, for seven weeks. A one-way classification multi-variant analysis of variance was used and it was concluded that both strength and endurance group exhibited significant difference in subcutaneous fat deposits. Endurance oriented exercise programs resulted in greater subcutaneous fats than the strength oriented exercise programme.

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39 Coker, Homer L.; “Selected Pre-Activity Calisthenics Programs And Effects Upon The Physical Fitness Of The College Male”, Completed Research In Health Physical Education And Recreation, 7: (1965); p-36.

40 Trahan, B.J.;” The Effect Of Specific Exercise Programme On The Composition Of Women.” Dissertation Abstracts International, 14:2 (Feb1974); 4847-A.
While studying the effect of physical conditioning programme on selected physiological variables of college-age women gymnasts, Salih33, concluded that there was significant differences in trail effect indicating an increase or decrease from pre- to post-test. Significant improvements were found in anaerobic threshold heart rate, resting blood pressure in the standing position, percent body fat from both skin-fold and under-water weighing and all strength measures except for right leg strength. No significant differences were found in the means of VO2max (ml/kg/min), percentage of Max VO2 at anaerobic threshold, supine resting blood pressure, resting heart rate, and right leg strength.

Murray 41 conducted a study for the comparison of physical fitness achievement of students subjected to two different types of physical education programme at Chadron State College. The purpose of this study was to compare the physical fitness achievement of freshman males enrolled in a new physical fitness programme with the physical fitness achievement of students enrolled in activity type classes. A modified Iowa Physical Fitness Test was used as the instrument of measurement. The physical fitness classes showed a significant (.001) increase in physical fitness achievement and the activity classes showed no significant improvement.

41 Murray Guy B.;“A Comparison Of Physical Fitness Achievement Of Students Subjected To Two Different Types Of Physical Education Programs At Chadron State College”, (Completed Research In Health Physical Education And Recreation, 10:(1968); p-22.
Namars investigated the effects of conditioning programme on selected physical and physiological parameters of college students. Pre-and post-test measures were collected separate group sessions, prior and after completion of the ten-week programme. It is of interest to note that females improved at best as much on all training methods as did the males, for all variables although there were no statistically significant difference among the methods.

Effect of physical education and sports participation on the physical fitness:

Stanley attempted to find out the effect of calisthenics and game type programs on the physical fitness of elementary school children. For this study he compared the effect of three exercise and developmental activities, exercises and games, and games only, on physical fitness as measured by the AAHPER Youth Fitness Test. A programme of exercises plus development activities produced superior gains in sit-ups, pull-ups and the standing broad jumps. A programme of exercises and games resulted in improved performances in the 50-yard dash and the shuttle run. A programme of games only produced superior performances in the softball throw for distance and

42 Namars, Michel J.; “The Effect Of Three Conditioning Program On Selected Physical And Physiological Parameter Of College Student” (Dissertation Abstracts International, 38: (Dec 1978); 7212-A

43 Stanley, William; “The Effect Of Calisthenics And Game Type Programs On The Physical Fitness Of Elementary School Children”, Completed Research In Health Physical Education And Recreation, 7:(1965); p-37.
the 800-yard walk-run. All three programs produced significant improvement.

Savage 44 attempted to find out the comparative effects of beginning boxing class and a beginning handball class to determine whether classes held twice a week improved physical condition, which programme developed greater strength and which programme developed greater cardio-vascular endurance.

Haliatt 45 found that neither programme produced significant (.05) changes in any of the selected measures of physical fitness; nor no significant differences were found between the groups when the post-test results were compared. While studying the effect of isometric contraction and progressive body conditioning exercises on selected aspects of physical fitness and badminton achievement of college women, carr8 found that body-conditioning exercises produced the greatest improvement in physical fitness, but isometric and body conditioning exercises did not effect significantly greater improvement that badminton instruction alone. The time devoted to these programs caused little or no effect on badminton achievement.

44 Savage, David Carl.; “The Comparative Effects Of A Beginning Boxing Class And A Beginning Handball Class On Physical Fitness”, Completed Research In Health Physical Education And Recreation, 10: (1968) ;p- 65.

45 Hallatt, Margaret M.; “A Comparison Of Physical Fitness Levels Achieved By Grade Ten Girls Through A Physical Education Program And A Competitive Sports Program”, Completed Research In Health Physical Education And Recreation, 10:(1965); P-65.
Helvey \(^{46}\) conducted a test with a view to find out the effect of isometric, isotonic and sports programs on physical fitness with elected 127 college male. The AAHPER Youth Fitness Test was administered before and after the 8-week programs. All three programs improved physical fitness. Certain aspects of physical fitness were affected more by one type of programme than another.

Harryman \(^{47}\) attempted to explore the contribution of physical education and athletics to the physical fitness of shoveling high school boys. For this the AAHPER Youth Fitness Test was administered twice to none-participant, physical education and athletic team groups. The results indicated that the level of physical fitness was related to the level of and intensity of physical activity. Students no participating regularly in physical activity decreased in physical fitness.

Gautschi \(^{48}\) investigated the effects of specialized training on the physical fitness of university competitive swimmers.

\(^{46}\) Halvey, Omer J.; "The Effect Of Isometric, Isotonic And Sports Program On Physical Fitness", Completed Research In Health Physical Education And Recreation, 7: (1965); P-37.

\(^{47}\) Harryman, James W.; "The Contribution Of Physical Education And Athletic To The Physical Fitness Of Shoreline High School Boys", Completed Research In Health Physical Education And Recreation, 7: (1965); P-128.

\(^{48}\) Gautschi, Edwin H.M.; "The Effect Of Specialized Training On The Physical Fitness Of University Competitive Swimmers", Research In Health Physical Education And Recreation, 9 (1963); P-43.
He found that the only mean improvements observed were in china, dips, reaction time, and ankle flexibility items and most of the improvement occurred in the first half of the season. All swimmers improved upon their former best times in competition.

Cambell 49 conducted the effect of supplemental weight training on the physical fitness of athletic squads. The purpose of this study was to determine how weight training affected the physical fitness of football, basketball and track and field squads when it was used as a supplement to normal training during different halves of the season. In each sport the athletes were divided into two matched groups and did weight training during the first half of the season only, and the other group during second half only. In general, the resulting statistics show that weight training adds significantly to the physical fitness produced by normal training.

Lewis 50 compared three methods of conditioning upon strength and speed. Endurance and selected basketball skills. Test was conducted on the male college students (N=90) participated in 12-week training and conditioning programme. The subject were randomly placed in one of three treatment groups and were identified at the traditional group, usually characterized by conventional exercise, the resistive exercise


50 Lewis, Frederic B.; “A Comparison At Three Method Of Conditioning Upon Strength Speed By Selected Basketball Skills”, Completed Research In Health Physical Education And Recreation, 10; (1956); p-58.
Swedburg 51 studied 88n male college students by treating them with three different pace training methods namely, continuous running, interval running and continuous pace running and determined the effect of different training methods on Cooper Twelve Minute Run/Walk Test and blood pressure. The fourth treatment group was controlled which participated in no organized training during the experiment. The training was carried out for a period of eight weeks. It was concluded that gains of all the four groups were significant on cooper twelve-minute run/walk test. The interval and continuous pace training groups showed significant gains on the cooper twelve-minute run/walk test when compared to control group.

Davies 52 selected 118 university students to study the effects of three work intensity-training programs on cardio-respiratory fitness. The subjects were assigned to one of the three experimental procedures or the control group. The methods of training employed were the crest load training procedure, continuous running and high intensity running. The subjects followed a prescribed workout procedure for thirty minutes each session three times a week for six weeks. It was concluded that three training groups showed significantly greater improvement in cardio-respiratory fitness than did the control group. However, no significant difference was demonstrated among three training procedures. It was also concluded that reduction in resting pulse rate indicated the

51 Swedburg, Randy Brent; “A Comparison Of Three Methods Of Pace Training For Distance Running”, Dissertation Abstracts International, 35: 8.(1975); 5101-5102.

continuous running to be superior to the crest load training procedure.

Sorenson 53 developed aerobic dancing and investigated its effect on the circulatory respiratory system as evaluated by Cooper's 12-minute run/walk test. Initially 61 percent of the subjects were in the very poor and poor categories on Cooper's scale. With the participation in aerobic dance, 25 percent shifted to good and 3 percent to excellent categories whereas only 27 percent remained in the poor and very poor categories.

Mass 54 undertook a study to investigate whether aerobic dancing was vigorous enough to elicit a heart rate capable of producing a training effect and whether the training heart rate was maintained. She observed that aerobic dancing conditioning programme elicited and maintained a heart rate which indicated a training effect and improved the fitness level of the subjects as evaluated by 12 min. run/walk test. She further concluded that aerobic dancing had built in progressive workloads that were essential for an effective fitness programme.

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54 Mass, Sonia H.; "A Study Of The Cardio-Vascular Training Effects Of Aerobic Dance Instruction Among College Age Females." Physical Fitness Research Digest 7:4 (October 1977); p-10.
In the study undertaken by Knehr, Bill and Neufeld (1977) college men participated in a training regimen for middle distance running for six months. The training programme was planned with over-distance running on one day and pace and speed work on the other two days. It was concluded that the resting heart rate reduced significantly as a result of this training.

Wallin and Schendel studies changes in heart rate in 21 sedentary business and professional men 31 to 60 years of age as a result of participation in a 10 week jogging programme, three days a week. At the start of training the subjects first walked and then jogged at 55 yards intervals for one half mile. As they progressed in training, the length of distance intervals gradually increased, as did the total distance jogged. At the end of ten weeks most subjects were able to jog continuously for distance ranging from two to three miles without avoidance of strain. The results showed that resting heart rate was significantly reduced.

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56 Wallin, Charles A. And Schendel, Jack S.; “Physiological Changes In Middle Aged Men Following A Ten Week Jogging Programme”, Research Quarterly, 40:3. (October 1961); p-60.
Assman 57 (1977) studies the effects of rope skipping, jogging and running on curculio-respiratory endurance and concluded that all the three groups improved as reflected in their performance on cooper’s 12 minute run/walk test, the rope skipping group making substantial gains.

Barris 58 (1979) compared the effects of a six-week aerobic dance and folk dance programme with the effects of a six-week aerobic jogging programme on the cardio-vascular efficiency and percent of body fat. Seventy-six post-pubescent females enrolled in physical education classes served as subjects who were divided into three groups-dancers, joggers, and control. The subjects met five days a week for six weeks. The subjects were pre-tested and post-tested. The cooper modification of Balke treadmill test was used to determine cardio-vascular efficiency. The results of the study indicated that (i) a six-week programme of aerobic dance and folk dance will increase cardio-vascular efficiency; (ii) a six-week program of aerobic jogging will increase cardio-vascular efficiency. Results also indicate no significant difference in effects of the two programs.


In a study by Chambers (1981) 62 women were randomly chosen from sections of beginning modern dance, ballet, and jazz to participate in pre and post tests of four parameters. The 12-week treatment was attendance in their respective dance class two days a week, 40-45 minutes per session. A control group also participated in pre and post tests. They were women selected from a health class and had virtually no physical activity for the treatment period. The gain scores between pre and post-tests were significant for all parameters tested. Percent body fat was the most significant at .001 level. And cardio-vascular changes were significant at the .053 level. The data indicated that the beginning level dance class could contribute significantly toward specific fitness parameters.

White; et.al. (1983) studied the effects of six month, 4 day a week aerobic dancing program on the cardio-vascular and muscular systems of post-menopausal women. Comparisons were made with a similar group of women engaged a walking program. Subjects consisted of 43 women, aged 50-63 years, randomly assigned to each group. A modified Balke treadmill test to a heart rate of 145 beats per minute was used to assess changes in cardio-vascular fitness with training. Results indicated that both forms of exercise were equally effective in increasing the efficiency of the cardio-vascular systems of the women. Both groups demonstrated significant increases in treadmill time (17%, p<.01 and 19%, p<.01


respectively), while showing significant decreases in resting heart rate, blood pressure products and recovery heart rates. The magnitude of the changes was quite similar between the two groups. A cable tensiometer was used to evaluate muscular strength changes with aerobic training. Specificity of training was reflected in the results, in that the members of walking group significantly improved ankle planter flexion strength (17%, p .001) while the members of the dancing group improved elbow flexion strength (6%, p .05). Both groups significantly gained strength in knee extension (Walkers 14%, p .001, dancers 8%, p .05). In conclusion, both forms of aerobic training results in significant and very similar cardio-vascular and muscular adaptations in postmenopausal women.

Fung 61 (1982) compared Chinese and American female artistic dancers on three selected physical fitness measures. 40 American and Hong-kong Chinese artistic dancers between the ages of 16-21 years were given the sit and reach test, the vertical jump test and the modified Harvard step test. Three 2x2 ANOVAs were used to analyze the effect of dance experience and race on physical fitness parameters. Results indicated that advanced dancers have a higher degree of forward flexibility than beginner dancers (21.8 cm. Vs 18.8 cm.) but no difference in the vertical jump scores and the step test scores were found. American dancers scored better than Chinese in the modified Harvard step test (57.7 PEI v/s 47.6 PEI) but not in the sit and reach and vertical jump test. Similar test scores were reported by studied on other athletes within each race. It is speculated that the difference observed between American and Chinese dancers may

61 Fung, Mary Lena; "A Comparison Of Chinese And American Female Artistic Dancers On Three Selected Physical Fitness Measures", Completed Research in Health, Physical Education And Recreation And Dance 24: (1982); p- 74.
be the result of the different emphasis in dance instruction in their countries.

Alteri 62 (1975) undertook a study taking sixty three college aged female between 17 and 22 years of age who were randomly assigned to one of four running regimens described as (i) interval running group two times a week, (ii) long slow distance endurance running twice a week, (iii) interval running group thrice a week and (iv) long slow distance endurance running thrice a week. The study revealed that after the training:

(a) Cholesterol level elevated for Group-II
(b) Increases serum lactate dehydrogenase in all four groups.
(c) Triglyceride values elevated for groups-II, III AND IV.
(d) Calf girth increased for groups-I and III.
(e) Decreased supraventricular skin fold for groups-I, II and III, while group-II and III also decreased in sub-scapular skin fold.
(f) Resting heart rate lowered for groups-I and II.
(g) Increased post-exercise systolic blood pressure for group-II and III.
(h) Reduced diastolic blood pressure for group-III and IV.
(i) Improved distance covered on the cooper12 minute run/walk test for women in all groups and;
(j) Increased maximal aerobic power for groups-III and IV.

Priest \textsuperscript{63} (1984) designed a study to determine whether or not significant changes occur in flexibility, heart rate, body weight, selected Anthropometrics measurements, body fat, and general physical condition as a result of participation in aerobic dancing and/or aerobics. Ninety two east Texas state university female volunteers served as subjects who participates in the pre-test and post-test conducted on twelve minutes run, skin fold measurements, Anthropometrics measurements, sit and reach test and resting heart rate. Class sections randomly assigned to one of the training regimens, exercised for fifty minutes three times a week for a period of six weeks. A third group participated as the control group. It was found that the resting heart rate of the aerobics group was significantly lower on the post-test. Flexibility of the aerobics group improved significantly. Analysis of the Anthropometrics measures revealed that the control group exercised a significant gain on the gluteus measurement. The aerobics group gained on the abdominal measurement and the aerobic dancing group gained in the gluteus and lost in both things. The aerobic dancing group lost body fat. Both dance groups showed a significant gain in distance covered in the twelve minute run. It was concluded from the study that \( \text{i) participation in the both dance programs resulted in an increase in the general level of physical fitness, (ii) participation in the aerobic dancing programme significantly reduced body fat, (iii) participation in the aerobics programme significantly increased flexibility, (iv) neither participation in the aerobics not aerobic dancing produced significant change in body weight, (v) participation in aerobic dancing resulted in significant changes in various Anthropometrics measures along with a}

\textsuperscript{63} Preist, Nita Nelson; "Comparative Effects Of Two Programs Of Aerobic Dance On The Flexibility, Body Composition And General Physical Condition Of Selected College Women", Dissertation Abstracts International, 44:7. (January 1984); 2086-A.
significant decrease in body fat. These results considered in conjunction with the fact that there was not a corresponding significant weight loss, indicates that participation in the aerobic dancing caused an increase lean muscle mass and/or a decrease in body fat mass.

Gentry determined the effects of a nine weeks aerobic jogging performance on selected cardio-vascular function of young male college students through a time course evaluation programme. Pre-test and post-test administered at the end of third, sixth and ninth weeks in order to evaluate the effects of training programs. He studied the following cardio-vascular functions: resting and exercise cardiac output, cardiac index, stroke volume, stroke index, O2 pulse, and heart rate. Additional measurements were taken of resting systolic and diastolic blood pressures and plasma cholesterol. It was concluded that there was significant increase in resting cardiac output, resting and exercise stroke volume, resting and exercise stroke index, resting and exercise O2 pulse, and plasma cholesterol. Significant decreases were observed in resting diastolic blood pressure and steady state heart rate, while no change occurred in exercise cardiac output, resting and exercise cardiac index, and resting heart rate.

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Coubey determined and compared the effect of training at various heart rate intensities of exercise on the cardio-respiratory fitness of a selected group of college men. It was also the purpose of this study to determine the threshold level and optimum level for elevating the heart rate in producing a change in cardio-respiratory fitness, while training for a distance of one mile, four days a week, for six weeks. Fifty subjects were divided into five equal groups. There were four experimental groups and a control group. The experimental groups consisted of four levels of heart rate intensities, which are determined by finding a percentage of the difference from the resting and maximal heart rate values. The heart rate intensities investigated were the 60, 70, 80 and 90 percent intensity levels. Each subject in the experimental groups was required to train on a motor driven treadmill at a pre-assigned working heart rate intensity for a distance of one mile. The pre-assigned working heart rate intensity was calculated for each subject at each of the four-intensity level. Cardio-respiratory fitness assessments were measured by maximum oxygen consumption, maximum heart rates, resting heart rates, and workload changes. Gains from pre-test to post-test assessments were analyzed by the 5x2 analysis of variance technique. The 5x2 analysis of variance technique was also used to analyze the post-test data. The conclusion made from the study were: (i) an exercise program which elevates the heart rate between 70 and 90 percent will reduce the resting and maximum heart rate; will increase maximum oxygen consumption and will increase the capacity to do more work. (ii) The threshold level for an exercise program to effect a change in resting

65 Coubey, Richard Bryant; “The Effect Of Training At Various Heart Rate Intensities On Cardio-Respiratory Fitness”, Dissertation Abstracts International, 33:3. (September 1972); 1006-A.
heart rate, maximum heart rate and maximum oxygen consumption must elevate the heart rate slightly above 70 percent intensity level. (iii) The threshold level for an exercise program to effect a workload change must elevate the heart rate to the 70 percent intensity level.

Bennett 66 (1956) formulated a study to determine the relative contributions of four physical education activities to the development of selected and general motor abilities of college women. The purpose of the study was to determine the relative contribution of modern dance, folk dance, basketball and swimming to related and general motor abilities of college women. Seventy nine college freshman women, divided at random into the four classes, were given eleven tests designed to measure endurance, abdominal strength, flexibility, power, speed, leg strength, arm and shoulder girdle strength, coordination, balance, and general motor ability. The tests were administered at the end of 16 weeks of training. The relative status of the four activities in the development of selected and general motor abilities was first, swimming and modern dance; second, basketball; and third, folk dance.

Parks 67 (1980) undertook a study to determine the effects of ten-week physical fitness programme on selected physiological and psychological variables of elderly 15 females of 65 to 82 years. Pre


67 Parks, Charles James; “The Effects of A Physical Fitness Program On Body Composition, Flexibility, Heart Rate, Blood Pressure And Anxiety Levels Of Senior Citizens”, Dissertation Abstracts International, 41 (July 1980); 1157-A.
and post measurements were obtained for psychological variables by the state-trait anxiety inventory. The physiological variables measured were body composition, flexibility, heart rate and blood pressure. The subjects participated in the fitness programme half an hour in the morning. Three days a week for 10 weeks. Each exercise session began with a 10 min. Warming up followed by 15 minutes of exercises of moderate intensity. The last 5 minutes were used as a cooling-off period. The ‘t’ test was employed to analyze the data. The following significant changes were found: (i) The subjects decreased in percentage of body fat, (ii) there was an increase in flexibility, (iii) there was a decrease in heart rate. However, no significant changes in systolic and diastolic blood pressure and anxiety levels of subjects were observed.

James 68 investigated the effects of isotonic and isometric exercise on subjects in heart rate and blood pressure and sought to determine the relationship of three effects of physical work capacity. He reached the conclusion that both isotonic and isometric exercises resulted in significant changes in heart rate, systolic and diastolic blood pressure and pulse pressure.

68 James, Sam E.; “The Effects Of Isotonic And Isometric Exercise On Heart Rate And Blood Pressure And Their Relationship To Physical Work Capacity In College Men”, Dissertation Abstracts International, 34 (February 1973); 178-A.
Lathen 69 conducted a study on rest to determine the effects of three types of treadmill running programme (14 weeks) on body weight, total body fat, and percentage of body fat, than interval group. Further, the study revealed that continuous method had the greatest change in body composition. However, no change was observed in resting heart rate.

A comparison of the body composition and selected components of motor and physiological fitness of female dancers and softball players was done by Moore 70 (1980). Subjects of the study were 14 female softball players, 14 female jazz dancers and 13 female control students. Tests selected to assess motor fitness were the sit and reach and the vertical power jump tests. Body composition was determined by underwater weighing. A running treadmill test was used to judge physiological fitness. Data were analyzed utilizing ANOVA and the Shuffle’s post-hoc comparison test. The softball players demonstrated significantly greater endurance than the jazz dancers and the control subjects. The jazz dancers demonstrated greater flexibility that the softball players, and the control group demonstrated greater flexibility than the softball players. They were no difference among 3 groups in percent on body fat.

69 Lathen, Calvin Wesley; “Running Programmes And Their Effects On Resting Heart Rate, Body Composition And Selected Muscle Weights In Rate”, Dissertation Abstracts International, 34 (November 1973); 2369-A.

70 Moore, S.B.; “A Comparison Of The Body Composition And Selected Components Of Motor And Physiological Fitness Of Female Dancers And Softball Players”, Completed Research In Health, Physical Education And Recreation, 22 (1980); p- 261.
A specific exercise and dance program was designed by Munns (1979) for his study to reverse the habits of inactivity and improve the range of joint motion in elderly subjects. 20 experimental subjects (mean ages 71.8 years) and 20 control subjects (mean ages 73 years), all of north eastern dance country were pre-tested on 6 single joint action. The Leighton flexometer was use to measure single joint actions. Using hotelling's t2, the mean range of pre-test joint motion scores was not significantly different (p .01). The experimental group participated in the exercise and dance programme, which met for one hour, three times/week, for 12 weeks. Control subjects received no treatment. At the completion of the 12 weeks program, all 40 subjects were post-tested. Overall group means, combining all 6 variables, were significantly different. The means of each of the six measurement variables were also significantly different. The program experiences a 0% attrition rate and attendance was excellent throughout the 12 weeks. Experimental subjects indicated an increased comfort in movement and an improvement in the performance of daily life activities.

The purpose of the study of Voll (1979) was to determine if ability in basic modern dance skills could be predicted by means of selected Anthropometrics and physical fitness measurements. Data

71 Munns, Kathleen M.; "The Effects Of A 12-Week Exercise And Dance Program On The Range Of Joint Motion Of Elderly Subjects", Completed Research In Health, Physical Education And Recreation, 21 (1979); p- 292.

72 Voll, Bonnie M.; "Predicting Ability In Basic Modern Dance Skills Through Selected Anthropometric And Physical Fitness Measurements", Completed Research In Health, Physical Education And Recreation, 21 (1979); p-114.
for this study were collected on 24 female students participating in one of three northeastern Pennsylvania colleges. Measurements of height, weight, sitting vertex height left trochanterion height, left tibial length, upper leg length, flexibility, abdominal strength, leg strength, cardio-vascular fitness and somatotyping were taken. These measurements and 6 Anthropometrics ratios were statistically treated by BMDOZR step-wise regression program developed by the health science computing facility, university of California at Los Angeles. A regression equation with a multiple r of .8678 was presented by the author for the prediction of ability in basic modern dance skills and prediction tables for its computation were developed. This equation required the collection of five Anthropometrics measurements and two physical fitness tests. On the basis of the findings of this study, the author concluded that ability in basic modern dance skills can be predicted from selected Anthropometrics and physical fitness measurements.

Upton et.al. 73 (1983) Conducted a comparative study on seventy-three female volunteers, age 31 to 53 years, out of which thirty-eight women were distance runners and thirty-five comprised sedentary control. The physiological profiles of the two groups were compared on the variables of hemoglobin concentration, haematocrit; body fat; forced vital capacity (FVC); forced expiratory volume (FEV); Maximum voluntary ventilation (MVV); heart rate; Blood pressure and Maximal Oxygen Uptake measured during treadmill Test. Student’s ‘t’ test was applied to each variable to determine if a significant difference between the trained and untrained groups existed. All

73 Upton, S.J. et. al. “Comparison Of Physiological Profiles Of Middle Aged Women Distance Runners and Sedentary Women”, Research Quarterly For Exercise And Sport, 54:1. (March 1983); p-83.
subjects were similar in age and height, but the untrained subjects were significantly greater than the trained subjects in total body weight. The sedentary women possessed a significantly greater amount of body fat, whereas both groups were equivalent in lean body weight. The women runners had significantly greater maximal aerobic power. Means of EVC and FEV were equivalent for the two groups. The trained group of women had significantly lower resting heart rates, while no difference was found in maximum heart rates between the two groups. In addition, hematocrit was equivalent, whereas hemoglobin concentration significantly lower in the trained females.

The study of walker 74 (1977) compared ratings of perceived exertion of aerobic dance and treadmill performances under equal workloads and compared ratings of perceived exertion by males and females in aerobic dance and treadmill work. Subjects were 26 college men and women in co-educational conditioning classes. Heart rates were monitored after work bouts and perceived exertion was determined using Borg’s RPE scale. Data were analyzed by a two way ANOVA with repeated measures. Conclusions were: aerobic dance is perceived as less strenuous than the treadmill under equal workloads and males and females perceive aerobic dance as less strenuous than the treadmill under equal energy bouts.

74 Walker, Nancy D.; “A Comparison Of Perceived Exertion Ratings Of Aerobic Dance And Treadmill Performances Among College Age Males And Females”, Completed Research In Health, Physical Education And Recreation, 19:(1977); p- 162.
Ortman \(^{75}\) undertook a study on prepubescent, pubescent and post-pubescent girls (N=147) who were divided into groups with and without previous dance experience. Weight, age, sitting height and standing height were measured and the subjects were given a balance beam test and the Iowa Brace Motor Ability Test. Comparison of the balance beam results with 'i' showed that the pubescent dance group was significantly superior on the first trial and that the post pubescent dance group was significantly superior on the fifth trial. Chi-square showed that the dance group tended to have progressively better balance at the pubescent and post-pubescent levels. The correlation between balance and the Anthropometrics measures were essentially zero.

King \(^{76}\) (1963) investigated the effects of two training programs on selected cardio-respiratory variables of college women. The two programs were riding bicycles and running. The physiological reaction measured were pulse rate, inspiration rate, inspiration amplitude, minute volume of inspiration and oxygen consumption. The respiratory variables were recorded simultaneously by a respirator. All variables improved during training programme prescribed. Both training programs were of sufficient duration and intensity to effect changes in post-exercise scores.

\(^{75}\) Ortman, Rosemary; \textit{"Relationship Between Dance And Balance In Girls"}, Completed Research In Health, Physical Education And Recreation, 6 (1964); p-77.

\(^{76}\) King, Louise Chaloc.; \textit{"An Investigation Of The Effects Of Two Training Programmes On Selected Cardio-Respiratory Variables Of College Women"}, Completed Research In Health, Physical Education And Recreation, 5 (1963); p- 101.
Michael, and Gallon (1960) studied pulse wave and blood pressure during a physical training programme. Members of the Santa Barbara basketball team were tested periodically during and after the 1957-58 season of play. The changes in physical conditioning were estimated using a step test. During this period of time the blood pressure and pulse wave measurements were studied to investigate the effects of basketball conditioning on these measurements. The resting and post exercise systolic blood pressure measurements decreased significantly during training. The changes were significant after 16 weeks. During de-training these measurements reversed and made significant changes in ten weeks. Pulse wave changes also changed significantly in six weeks, leveled off, and finally reversed to starting level during detraining.

Toit administered a training programme to two groups employing weight training and progressive run and noted that the running group showed a significant reduction in pulse rate, diastolic blood pressure and an increased in pulse pressure and basal oxygen consumption.

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78 Toit, D. U. "Circulatory Respiratory Endurance Improvement", Physical Fitness Research Digest 5 (July 1974); P- 20.
Vaccaro and Clinton examined the effects of ten weeks of aerobic dance conditioning on the body composition and \( \text{vo2max} \) of college women ranging in age from 19-27 years. Prior to the ten-week training period the subjects were assessed for body composition using the hydrostatic weighing technique and \( \text{vo2max} \). \( \text{Vo2max} \) and maximum heart rate using a progressive treadmill test. These same measures were then repeated following the aerobic dance-conditioning programme. Results of the analyses indicated that the aerobic dance training period was of sufficient intensity, frequency and duration to elicit favorable changes in \( \text{vo2max} \). (P.05). However, this training regimen did not favorable alter the percent fat of the subjects (p.05).

Baum (1973) exposed 23 subjects from the Wilton State School In Wilton, New York of ages 24 through 35 to 30 sessions of dance therapy for a period of 6 week. The units of dance therapy were developed in 3 sections: Warm up exercises, flexibility exercises, and natural movements. A goniometer was use to measure hip abduction, hip flexion, and painter flexion before, after and 6 week following the experimental period of dance therapy. A one way ANOVA with repeated measured indicated improvement in hip abduction and hip flexion after participation in a program of dance therapy for 6 weeks.

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80 Baun, Mary Anne; “The Relationship Between Participation In A Program Of Dance Therapy And Changes In Flexibility Of Selected Joints Of Educable Mentally Retarded”, Completed Research In Health, Physical Education And Recreation, 15:(1973); p- 140.
Delsanto (1976) conducted a study to determine the effects of physical conditioning programs, on selected physiological components, and cardio-vascular fitness. Seventy-six college men were related as subjects and they were divided into four groups. Group-I participated in Cooper's aerobic programme and Group-II was given interval-conditioning programme. Group-iii had regular physical education programme and for Group-IV no special programme was given and they acted as the control group. The results of the study revealed that though the control group did not improve in its cardio-vascular fitness, the other three groups, Cooper's aerobic programme group, interval conditioning programme group and the regular physical education programme group exhibited a significant improvement in cardio-vascular fitness.

Pilch (1971) conducted a study to determine the cardio-vascular responses on selected middle-aged subjects to regular period of exercise. In this study blood pressure (systolic and diastolic) was one of the cardio-vascular parameters. All subjects participated in the regular period of exercise i.e., pedaled the bicycle ergo meter thirty minutes a day, four days a week from six weeks at the workload that kept the heart rate at 135 per minute. The results showed that there was a significant improvement in systolic blood pressure at the levels

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81 Delsanto, Frank; "A Study Of The Effects Of Physical Conditioning Programme On Selected Physiological Components Of College Men", Dissertation Abstracts International, 36 (June 1976); 7928-A.

82 Pilch, Arther Henry; "Comparative Effects Of Two Programs Of Aerobic Dance On The Flexibility, Body Composition And General Physical Condition Of Selected College Women", Dissertation Abstracts International, 44: (January 1984); 2086-A.
except at 1200 pounds/meter. Diastolic showed improvement at 300 and 750 pounds/meter. Form the results it was concluded that training of one and half-month duration with the heart rate approximately 135 beats per minute was adequate for cardio-vascular training stimulus for middle aged.

Israel (1977) studied the effects of aerobic, anaerobic and pulse work out exercises on selected physical fitness and physiological parameters. The subjects were 65 volunteer male undergraduate students. The subjects were grouped into three experimental groups and on control group. The experimental group worked four days a week for five weeks, while the control group was not allowed to participate in any exercise programme. The exercise programme consisted of aerobic treatment of 30 minutes continuous jogging session, anaerobic treatment of 15 maximal sprints 40 yards in length and the pulse workout treatment, which was of two sets of four workouts each on e quarter mile in length. The pulse workout exercise programme was administered to work the subjects at their optimal work capacity (180 bpm). Cooper’s 12-minute run and walk test, Balke Treadmill Test and other physiological variables obtained the pre and post-test measurement. From the statistical analysis of variance, it was concluded that the aerobic and pulse workout exercise programs increases the cardio-vascular endurance significantly.

83 Israel, Richard Gay; "The Effects Of Aerobic, Anaerobic, And Pulse Workout Exercise On Selected Physical Fitness Parameters, Plasma cholesterol And Plasma Triglyceride Levels In College Males", Dissertation Abstracts International, 37: (February 1977); 4957-A.
Mayhew (1976) conducted a study on the relative contributions of body compositions on selected hematological parameters and aerobic capacity to endurance running performance of male and female adolescent track athletes. For this study 24 male and 21 female track athletes from school teams were selected as subjects. The tests administered were: all out treadmill run (a maximal oxygen intake treadmill test); Anthropometrical assessment; venous blood hemoglobin and hemocrit readings and 1000 and 2000 meter run for time. The results indicated significant differences in body composition and structure, hematological parameters, aerobic capacity and endurance running performance between adolescent male and female track athletes. The circulo-respiratory, body structure and body composition variables contributed significantly to endurance running performance in both male and female track athletes.

Nagle and Irwin (1960) undertook a study to determine the effects of two systems of eight week weight training on circulo-respiratory endurance and related physiological factors. The subjects (N=20) in each group were randomly divided into three groups. Two experimental group in addition participated in archery activity. The

84 Mayhew, Jerry Lawrence; “Relative Contributions Of Body Composition, Selected Hematological Parametric And Aerobic Capacity To Endurance Running Performance Of Male And Female Adolescent Track Athletes”, Dissertation Abstracts International 37 (July 1976); 179-A.

cardio-respiratory endurance and selected physiological responses were measured. Pre and Posttest analysis revealed that the experimental group showed improvement in circulo-respiratory responses while there were no significant differences among the three groups in their response to exercise.

Braxton (1975) studied the effects of calisthenics on heart rate of college women and found that sprinting and squad thrust exercises were considered anaerobic and could not be performed beyond sixty seconds. The jumping jack was considered as the most useful calisthenics exercise for cardio-vascular benefit. It was concluded that subjects could continue performing calisthenics by maintaining and heart rate level at 150 beats per minute.

The effects of two physical conditioning programs on cardio-vascular fitness in men were compared by Harper and others (1969). Twenty-five college men were selected as subjects for the study. On the basis of maximum oxygen consumption, the subjects were divided into three matched groups. Group-I participated in a modified army-conditioning programme of calisthenics and marching, Group-II participated in a programme of interval training involving running, and Group-III acted as control group and participated in recreational activities. The groups were trained for five days a week


for seven weeks. To evaluate the differences between pre and post conditioning, maximum oxygen consumption and Harvard Step Test indices were administered. The results showed that the interval trained group had no significant improvement in maximum oxygen consumption, but there was a significant improvement in the Harvard step Test indices. The control group did not show any significant improvement.

Sharkey and Holiman 88 studied the cardio-respiratory adaptations to training at specified intensities. Sixteen college men were selected as the subjects. The subjects were randomly divided into three training groups and one control group. The selected cardio-respiratory adaptations if six weeks of training elicited either 120, 150 or 180 heartbeats per minute. The training consisted of walking on the motor driven treadmill for 10 minutes a day, three days a week. The statistical analysis of the pre and posttest scores revealed that the 180 heartbeats per minute training group exhibited significant improvement over all other groups. The 150 groups had significant difference from the 120 and the control group. From the results it was concluded that intense activity is necessary to bring about the changes associated with cardio-respiratory endurance.

Parr 89 (1972) studied the effects of cardio-vascular respiratory adaptation to manipulate cardiac acceleration. The


subjects for this study were sixteen students from the general education section. The students were divided into three experimental groups. They were trained at 180 beats per minute, 160 bpm. And 140 bpm., for ten minutes a day, for five days a week for six weeks. To assess the aerobic capacity and resting heart rate pre and posttests were given to each subject. From the results it was concluded that aerobic capacity can be increased by training, based on heart rate intensify. A more pronounced difference would appear within the groups if the intensity of work were greater.

Gray ⁹⁰ (1978) conducted a study to determine the effect of three modes of aerobic training on cardio-vascular endurance. The three modes of aerobic training were cycling, jogging and swimming. 102 college men and women of 17 to 29 years of age were selected for the study. The subjects were divided into three groups at random. They were allowed to participate in the mode of training on their own (cycling, Jogging or Swimming). The three groups were further divided into sub-groups each as experimental and control sub-groups. The experimental group exercised for 40 minutes a day for three times a week for seven consecutive weeks. From the result it was concluded that aerobic exercise programme produced a significant difference with a significant increase in cardio-vascular endurance. There was no significant difference in cardio-vascular endurance in the aerobic training modes of cycling, jogging and swimming.

Massicotte and Others ⁹¹ studied the effects of aerobic training on men and women. Twenty-three men and eleven women of age 20 to 55 years were selected as subjects for the study. All subjects participated in the aerobic training programme, one hour in the morning, three days a week, for three weeks. The pre and posttests data revealed significant increase in physical performance. Moreover from the results it was concluded that there was no significant difference in the effects of aerobic training on men and women.

Mayfield ⁹² (1982) studied the effects of aerobic dancing on the cardio-respiratory system of 40 selected females. The subjects were randomly grouped into experimental and control group. The aerobic dance programme was for ten weeks, three days a week for 45 minutes per session, as measured by the Astrand Rhyming Bicycle Ergometer test. Results of this study showed that individuals participating in the aerobic dance programme achieved significantly higher level of cardio-respiratory fitness in comparison to the control group.


Durant 

Durant, Barlene; "The Effects Of Jogging Rope Jumping And Aerobic Dance, On Body Composition And Maximum Oxygen Uptake Of College Females", Dissertation Abstracts International, 36 (January 1976); 4324-A.

respiratory fitness scores was made. The results revealed that neither exercise programme interval running nor continuous running was significant in terms of promoting cardio-respiratory fitness of the subjects.

Marscal (1983) undertook a study to determine the changes in psycho-physiological comparison of Cooper aerobics training programme and a running training programme. Forty-one males and 31 females were selected as the subjects, who were trained two days a week for 10 weeks. The data collected were compared to the changes in physical fitness variables, attitude towards physical activity and selected personality traits after ten weeks of training following continuous work on Cooper's aerobic programme. The results showed that participation in these exercise programs produced a more positive attitude toward physical activity, reduced level of neurotism decreased weight, decreased percent of body fat, decreased systolic and diastolic blood pressure and lower resting, exercise and recovery heart rates. The programs also increased vo2 scores, number of sit-ups and push-ups flexibility and leg extension strength.

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Marscal, Angela Faroh; "A Psycho-Physiological Comparison Of Cooper Aerobics Training Programme And A Running Training Programme", Dissertation Abstracts International, 43 (February 1983); 2596-A.
Standacher 96 (1963) studied the schoolboys’ physically fit and unfit with respect to certain cardio-respiratory components in which blood pressure was one of the components. Twenty-four subjects were selected randomly of grade twelve and were divided into two groups according to their physical ability. The subjects ran to exhaustion on a motor driven treadmill with the grade and speed increased every three minutes. Blood pressure, heart rate and oxygen consumption were measured before, during and after the run. It was found that there was statistically significant difference in case of oxygen consumption.

To compare the physiological effects of training in males and females participating in training programs nine males and eight females were selected for three training sessions per week over an eight-week period by Durke 97 (1972). The training programme consisted of half-mile interval runs beginning with one mile run per session in the first week and progressing to two and two and a half mile run I the eight week. Analysis of co-variance revealed a significant difference in improvement between the male experimental and control groups in vo2 max. (P=. 001). There was no significant difference (p=. 05) between the male and female experimental groups in vo2max. It was concluded that when males and females

96 Standacher, Raymond J.; “A Comparison Of The Reactions Of Selected Physically Fit And Unfit Secondary School Boys With Respect To Certain Cardio-Respiratory Components As Determined By Performance On Treadmill”, Competed Research In Health, Physical Education And Recreation, 5 (1963); p-93.

97 Durke, Edmond J.; “A Comparison Of The Physiological Effects Of Similar Training Programmes In Males And Females”, Research Quarterly,43:3. (1972); p-82.
From the results, it was concluded that regular physical education programme groups improved significantly in cardio-respiratory fitness in comparison to control group.

Dunn 98 (1980) selected 15 women and 13 men to participate in a 10-week programme of timed calisthenics. Assessment of aerobic capacity, strength and body composition were made at the beginning and at the conclusion of the study. Both men and women made similar improvements in all categories with the men scoring significantly higher than the women in aerobic capacity, 1.5 mile run, grip strength, jumping ability and body weight. Women showed significant improvement in 1.5 mile run. There was a remarkable increase in muscular endurance as measured by pull-ups and flexed arm hang time respectively. No changes were found in body composition, body weight and percent of body fat. There was a significant change in skin fold measurement. These data indicated that timed calisthenics is effective in increasing aerobic capacity, strength and endurance.

McCrimons; 99 investigated the effects of interval and continuous training on selected cardio-vascular responses in women

98 Dunn, Steven E.; “Changes in Aerobic Capacity Strength And Body Composition With Timed Calisthenics”, Dissertation Abstracts International, 40 (April 1980); 5363-A

99 McCrimon, Donald; “A comparison of interval and continuous training effects on selected central and peripheral cardio-vascular responses to exercise in women”, Completed Research in Health, Physical Education and Recreation; 19; (1977); p.-306
women. The subjects were grouped into three groups of five women each. All subjects participated in a twelve-week training programme of four days a week. The statistical analysis indicated that in response to high intensity training, women may demonstrated similar cardio-vascular adaptations to training as men.

Jette 100 (1976) determined the effect of modern dance with musical accompaniment and music with rhythmical activities on body image and self-concept in college women. One hundred eight female volunteers from the university of Minnesota, Minneapolis, were randomly divided into classes in one of the three treatment groups. Groups one and four participated in the modern dance with musical accompaniment. Groups two and five participated in the music with rhythmical activities. Both experimental groups met one hour a day, three days a week, for seven weeks. Groups three and six were the control. After the treatment period, no significant difference in body image or self-concepts was found between classes or groups.

Doris 101 (1993) compared the effects of aerobic exercise and Taekwon-Do upon cardio-respiratory endurance, muscle endurance and trunk and leg flexibility. A convenience sample of two groups of males between the ages of 18 and 35 (n=70) were measured for these attributes. Thirty-five men were evaluated before and after participating in an eight weeks of Taekwon-Do Karate. Both groups


101 Doris, Allen Ivar Young.; "Cardio-Respiratory Endurance And Flexibility: A Comparison Study Of Tackwon-Do And Aerobic Exercise In Adult Males", Dissertation Abstracts International, 53: (March1973); 3143-A.
achieved gains in cardio-respiratory endurance, muscle endurance, and flexibility. A pooled 't' test showed that there was no statistically significant difference between the groups for cardio-respiratory endurance or muscle endurance (p<.05).

Grayston 102 determined the effect of an eight-week water aerobics program on selected physiological measurements of 54 female participants aged 18 to 25 years. The previously sedentary subjects were divided into a control group (N=29) and an experimental group (n=25). The experimental group participated in a progressive water aerobics program three times per week for eight weeks. Each subject was pre and post-tested on resting heart rate, resting systolic blood pressure, resting diastolic blood pressure, body weight and percentage of body fat. Analysis of covariance was used to determine if any significant difference between the two groups existed on the variables. The result of this study indicated a significant difference at the .05 level in resting heart rate between the two groups. No differences were found in either systolic or diastolic blood pressure, body weight, or percentage of body fat. It was concluded that water aerobics could be of sufficient intensity to increase fitness levels for young, sedentary individuals.

From the above 102 review of literatures it is concluded that the present study is a new one as far the game of Kho-Kho is concerned. Even in India any body has not carried out the study. There is ample scope to carry out the present study.

102 Grayton, Judith Lee; “The Effect Of An Eight Week Water Aerobic Program On Selected Physiological Measurements Of Female Participants”, Dissertation Abstracts International, 51: (January 1991); 2312-A.