Chapter -II

REVIEW OF REALTED LITERATURE
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REVIEW OF RELATED LITERATURE

Sincere efforts have been made by the research scholar to locate literature related to this study. The relevant studies found from various sources, which the investigator has come across, are enumerated below.

Coksevim and Caksen\(^1\) carried out a research study to assess the exercise performance in healthy Turkish Adolescents. In this study, exercise performance was evaluated in 259 healthy adolescents by using some tests. The purpose of the study was to investigate exercise performance and cardio respiratory capacity in both adolescent boys and girls. The following tests were applied to all children: ball throw with right and left hands, vertical jump, long jump without prior motion, pull up (repetition number), flexibility, and agility (set repetition number) tests. Additionally, heart rate and systolic and diastolic blood pressures were measured. Applied Spirometric tests were as follows: vital capacity, forced vital capacity, forced expiration volume in the first second, ventilation volume, maximum volunteer ventilation and respiration frequency. This study found that heart rate was statistically significantly

higher in females than males (p<.05). There was also a statistically significant difference in vital capacity, forced vital capacity and forced expiratory volume in the first second (in both measured and predicted values) between males and females (p<.05). Additionally, it was found that there were statistically significant differences in the 60 and 200 meters races, maximal pull up, vertical jump, standing long jump, ball throwing with right hand, horizontal bar, and agility between the male and female groups (p<.05). In conclusion, the findings showed that although females were superior in the 60 and 200-meter race, males were superior in agility, horizontal bar, and ball throwing with right hand, long jump, and vertical jump.

George Kelley, Kristi A Kelley\(^2\) used the meta-analytic approach to examine the effects of aerobic exercise on resting systolic and diastolic blood pressure in adults. Forty-seven clinical trials representing 72 effect sizes in 2543 subjects (1653 exercise, 890 controls) met the criteria for inclusion. Statistically significant exercise-minus-control decreases were found for changes in resting systolic and diastolic blood pressure in both hypertensive (systolic, \(-6\) mm Hg, 95% CI, \(-8\) to \(-3\); diastolic, \(-5\) mm Hg to \(-8\) mm Hg).

Hg, 95% CI, -7 to -3) and normotensive (systolic, -2 mm Hg, 95% CI, -3 to -1; diastolic, -1 mm Hg, 95% CI, -2 to -1) groups. The differences between groups were statistically significant (systolic, p=0.008; diastolic, p=0.000). Relative decreases were approximately 4% (systolic) and 5% (diastolic) in hypertensive, and 2% (systolic) and 1% (diastolic) in normotensives. It was concluded that aerobic exercise reduces resting systolic and diastolic blood pressure in adults.

Blumenthal, et.al\(^3\) an attempt was made to assess the effects of aerobic exercise on the psychological functioning of a non-clinical sample of healthy middle-aged adults. Sixteen subjects participated in a 10-week program of regular walking-jogging, while a matched control group maintained their sedentary life-styles. All subjects completed a battery of psychological tests, including the Profile of Mood States, the State-Trait Anxiety Inventory and a retrospective questionnaire regarding self-perceptions of change. Examination of test scores revealed that scores for the exercise group almost always improved, whereas the scores for the control group remained the same or deteriorated. The exercisers exhibited less state and trait anxiety, less tension, depression, and fatigue, and more vigor than the controls. These results document the potential utility of

regular aerobic exercise in promoting psychological health in normal adults.

Helgerud, et.al.\textsuperscript{4} carried out an investigation to assess the effects of aerobic training on performance during soccer match and soccer specific tests. Nineteen male elite junior soccer players, age 18.1 ± 0.8 yr, randomly assigned to the training group (N = 9) and the control group (N = 10) participated in the study. The specific aerobic training consisted of interval training, four times 4 min at 90-95\% of maximal heart rate, with a 3-min jog in between; twice per week for 8 wk., Players were monitored by video during two matches, one before and one after the training. In the training group: a) maximal oxygen uptake (O\textsubscript{2}max) increased from 58.1 ± 4.5 ml/kg/min to 64.3 ± 3.9 ml/kg/min (P < 0.01); b) lactate threshold improved from 47.8 +/- 5.3 ml/kg/min to 55.4 ± 4.1 ml/kg/min (P < 0.01); c) running economy was also improved by 6.7\% (P < 0.05); d) distance covered during a match increased by 20\% in the training group (P < 0.01); e) number of sprints increased by 100\% (P < 0.01); f) number of involvements with the ball increased by 24\% (P < 0.05); g) the average work intensity during a soccer match, measured as

percent of maximal heart rate, was enhanced from $82.7 \pm 3.4\%$ to $85.6 \pm 3.1\%$ ($P < 0.05$); and h) no changes were found in maximal vertical jumping height, strength, speed, kicking velocity, kicking precision, or quality of passes after the training period. The control group showed no changes in any of the tested parameters. Enhanced aerobic endurance in soccer players improved soccer performance by increasing the distance covered, enhancing work intensity, and increasing the number of sprints and involvements with the ball during a match.

George A. Kelley\textsuperscript{5} conducted a study with an aim to use the meta-analytic approach to examine the effects of aerobic exercise on resting systolic and diastolic blood pressure among adult women. Studies were retrieved from computer searches (MEDLINE, Sport Discus, and Current Contents) and bibliographies of retrieved articles were cross-referenced. Inclusion criteria were as follows: (1) randomized trials, (2) aerobic activity as the primary exercise intervention, (3) comparative no exercise control group included, (4) changes in resting systolic and/or diastolic blood pressure assessed for women ages 18 and older, and (5) studies published in English-language journals between January 1966 and

January 1998. The primary outcomes retrieved in this study were changes in resting systolic and diastolic blood pressure calculated as the difference (exercise minus control) of the changes (initial minus final) in these mean values. Ten studies representing 732 subjects and 36 primary outcomes (19 systolic, 17 diastolic) met the criteria for inclusion. Overall, an approximate 2% decrease in resting systolic and 1% decrease in resting diastolic blood pressure were observed (systolic, $x \pm SD = -2 \pm 2.6$ mm Hg, 95% bootstrap confidence interval −3 to −1 mm Hg; diastolic, $x \pm SD = -1 \pm 1.9$ mm Hg, 95% bootstrap confidence interval −2 to −1 mm Hg). Aerobic exercise results in small reductions in resting systolic and diastolic blood pressure among adult women. However, a need exists for additional, well-designed studies on this topic, especially among hypertensive adult women.

Pollock, et.al$^6$ investigated and found that the Maximum oxygen uptake (VO2max) and body composition have been shown to deteriorate with age. How much of the decline is attributable to aging and how much is affected by reduced physical activity is not known. The purpose of this investigation was to determine the aerobic capacity and body composition of 24 master track athletes and to evaluate the relationship to age and

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maintenance of training over a 10-yr period. The subjects (50-82 yr of age) were retested after a 10.1-yr follow-up (T2). All continued their aerobic training, but only 11 were still highly competitive (COMP) and continued to train at the same intensity. The other 13 athletes studied became noncompetitive (post-COMP) and reduced their training intensity. The results showed the COMP group to maintain its VO2max and maximum O2 pulse while the post-COMP group showed a significant decline (54.2-53.3 vs. 52.5-45.9 ml/kg/min., 20.7-20.8 vs. 22.4-20.0 ml/beat from test one (T1) to T2 for the COMP vs. post-COMP groups, respectively). Maximum heart rate declined 7 beats per minute for both groups. Body composition showed no difference between groups from T1 to T2. For both groups body weight declined slightly (70.0-68.9 kg), percent fat increased significantly (13.1-15.1%), and fat-free weight decreased significantly (61.0-59.0 kg). Thus, when training was maintained, aerobic capacity remained unchanged over the follow-up period. Body composition changed for both groups and may have been related to aging and/or the type of training performed.
Thomas, et.al\textsuperscript{7} carried out a study, sought to evaluate the influence of gender, hypertension risk, and aerobic fitness on cardiovascular responses to laboratory-induced stress. Sixty non-symptomatic subjects (30 males, 30 females) participated in the experiment. Half of the subjects had at least one biological parent with hypertension, while half had no parental history of hypertension and served as comparison subjects. Subjects completed a laboratory procedure measuring cardiovascular responses (i.e., pulse rate and blood pressure) while performing stressful laboratory tasks (i.e., the Stroop Color Naming Test and a sham IQ test). Aerobic fitness using Bruce protocol was also determined using a submaximal treadmill test in the laboratory. Results suggest that males with a family history of hypertension were more stress responsive based on systolic blood pressure, while females were more stress-responsive according to pulse rate activity. Fitness levels were significantly associated with diastolic blood pressure throughout the stress and recovery periods but were unrelated to pulse rate and systolic blood pressure.

Andrew Maiorana, et.al.⁸ (2000), carried out a study to examine the effect of a novel circuit weight training (CWT) program on cardiorespiratory fitness, muscular strength, and body composition in 13 patients with chronic heart failure (CHF), using a prospective randomized crossover protocol. Peak exercise oxygen uptake (VO₂ peak) increased after the 8 week CWT program (19.5 ± 1.2 vs. 22.0 ± 1.5 ml/kg/min, P < 0.01), as did exercise test duration (15.2 ± 0.9 vs. 18.0 ± 1.1 min, P < 0.001). Sub maximal exercise heart rate was lower after training at 60 and 80 W (121 ± 3 vs. 134 ± 5 beats/min, P < 0.01) as was rate pressure product, whereas ventilatory threshold increased, from 52 ± 3 to 58 ± 3% of VO₂ peak (P < 0.05). CWT also increased maximal isotonic voluntary contractile strength for seven different muscle groups, from 392 to 462 kg (P = 0.001). CWT, an exercise prescription specifically targeting peripheral abnormalities in CHF, improves functional capacity and muscular strength in these patients.

Donnelly, et.al.\textsuperscript{9} carried out a study to investigate the effect of different aerobic training protocol on aerobic fitness, body weight, and lipid profile. The subjects performed continuous exercise at 60 to 75\% of maximum aerobic capacity, three days per week, 30 min per session, or exercised intermittently using brisk walking for two, 15 min sessions, five days per week. Significant improvements for aerobic capacity of 8\% and 6\% were shown for the continuous and intermittent exercise groups, respectively. Weight loss for the continuous exercise group was significant at 2.1\% from baseline weight and the intermittent group was essentially unchanged. The continuous group showed a significant decrease in percentage of body fat and fat weight while the intermittent group did not. HDL cholesterol and insulin were significantly improved for both groups. Continuous or intermittent exercise performed long-term may be effective for preventing weight gain and for improving some measures of metabolic fitness.

\footnotesize{\textsuperscript{9} E Donnelly, et.al, "The effects of 18 months of intermittent vs. continuous exercise on aerobic capacity, body weight and composition, and metabolic fitness in previously sedentary, moderately obese females", \textit{Department of Health, Sport and Exercise Sciences}, 104 Robinson Center, University of Kansas, Lawrence, USA. Volume 24, Number 5, Pp 566-572, May 2000.}
Dimeo, et.al.\textsuperscript{10} carried out a study on effect of aerobic training on patients of major depressive episode. Twelve patients (mean (SD) age 49 (10) years; five men, seven women) with a major depressive episode according to the Diagnostic and Statistical Manual of the American Society of Psychiatry (DSM IV) criteria participated. The mean (SD) duration of the depressive episode was 35 (21) weeks (range 12--96). Training consisted of walking on a treadmill following an interval training pattern and was carried out for 30 minutes a day for 10 days. At the end of the training programme, there was a clinically relevant and statistically significant reduction in depression scores (Hamilton Rating Scale for Depression: before, 19.5 (3.3); after, 13 (5.5); \( p = 0.002 \). Self assessed intensity of symptoms: before, 23.2 (7); after, 17.7 (8.1); \( p = 0.006 \). Values are mean (SD)). Subjective and objective changes in depression scores correlated strongly (\( r=0.66, p=0.01 \)). Aerobic exercise can produce substantial improvement in mood in patients with major depressive disorders in a short time. At the end of the training programme, there was a clinically relevant and statistically significant reduction in depression scores (Hamilton Rating Scale for Depression: before, 19.5 (3.3); after, 13 (5.5); \( p = 0.002 \). Self assessed intensity of

Symptoms: before, 23.2 (7); after, 17.7 (8.1); p = 0.006. Values are mean (SD). Subjective and objective changes in depression scores correlated strongly (r=0.66, p=0.01). Aerobic exercise can produce substantial improvement in mood in patients with major depressive disorders in a short time.

Arundhthi Sasikumar & Liji Mathew\textsuperscript{11} carried out a study to determine the effect of twelve weeks training on selected physical, physiological and psychological variables of novice hockey players. The study was conducted on twenty girls between the age group of 10-15, ten each from Sree Narayana Girls High School and John Paul Eluvathingal High School for girls and boys at Trichur district, Kerala State India. The subject has undergone hockey training five days in a week for a period of 12 weeks. Criterion measures chosen for testing the physical variables were AAHPER Youth fitness test (1976 revision). Physiological variables were tested by using the standardized test to measure Resting pulse rate, Body composition and Flexibility. The memory card and mood chart were used to measure psychological variables. Dependent 't' test was employed. The results of the study permit the following conclusions.

Participation in three months hockey training improved the following variables cardio respiratory endurance, Agility, Arm and Shoulder muscular endurance, Abdominal muscular endurance, Speed, Leg power, Flexibility, Body fat, cardiovascular system and Mood and memory status.

Dileep et.al.\(^{12}\) (2007) carried out a study on effect of selected physical exercise on Psychological Variables. The purpose of the present investigation is to explore the effect of yogic practices and physical exercises on psychological variables. The experimental design used in the study was random group design. The age group of this study was between 13 to 15 years. 90 subjects were selected in random from Vinaya Kumar high school, Ananthapur, AP. The selected students were randomly divided into three groups, in which group I underwent yogic exercises (n-30), Group II Physical exercises (n-30) and Group III (n-30) acted as control group. In the study the following variables were selected data were analyzed by using analysis of covariance (ANACOVA). Whenever the 'F' ratio was found to be significant, the Scheffe's test was used as post hoc test. The study found that the level of anxiety in the yoga group was found to be less than physical exercise group. The control group did

not show any significant improvement in level of anxiety and self-concept from pre test to post test. Thus, it was found that yogic practices contributed to improve the self-concept of individual better than physical exercise group.

Lakshmeesha\textsuperscript{13} carried out a study on 1200 school children of Karnataka State in the age group of 12 to 16 years. As an objective measurer of aerobic fitness, the maximal aerobic capacity (Vo2max) was found out by using popular multistage shuttle run test protocol (20MSR). Both relative and absolute values of maximal aerobic capacity were compared between 12 to 16 years boys and also with sporting children of our country. Mean relative maximal aerobic capacity (Vo2max) of Karnataka School boys found decreasing gradually from 12 to 16 years of age. Statistically speaking there was a significant decrease in relative maximal aerobic capacity between 12 to 16 years boys. He opined that, the decrease in the relative VO2 Max. during growing ages, is a alarming situation, where physical education programmes should be put in place to prevent deterioration of health related fitness. He also found the boys were very much inferior to the sporting group counterparts. Though there was an increase in mean values of absolute maximal aerobic capacity,

linear to the age from 12 years to 16, was not to the level of sporting children.

James, et.al.\(^{14}\) carried out a study where thirty-seven healthy type A men (mean age 42 years) were randomly assigned to either an aerobic exercise training group or to a strength and flexibility training group. Before exercise, subjects underwent comprehensive physiologic and behavioral assessments, including graded exercise treadmill testing with direct measurement of oxygen consumption (VO\(_2\)) and measurement of cardiovascular (heart rate, systolic and diastolic blood pressure and rate pressure product) and neuroendocrine (epinephrine and norepinephrine) responses to mental arithmetic. The aerobic exercise consisted of walking and jogging at an intensity of $\geq 70\%$ maximal heart rate reserve for 1 hour 3 times/week for 12 consecutive weeks. The strength training consisted of 1 hour of circuit Nautilus training 2 times/week for 12 weeks. At the completion of the exercise program, all subjects underwent repeat testing. For the aerobic group, peak VO\(_2\) increased significantly from 33.6 to 38.4 ml/kg/min ($p < 0.001$), whereas the strength group only achieved a slight increase from 34.5 to 35.6 ml/kg/min (difference not significant). During

the mental arithmetic, the aerobic group experienced a greater reduction in levels of heart rate, diastolic blood pressure and rate pressure product than the strength group (after completing the exercise training programs). The aerobic group also tended to secrete less epinephrine and to show a faster recovery than the strength group after the exercise program. In addition, the aerobic group tended to exhibit less cardiovascular reactivity to mental stress after exercise training. These data suggest that aerobic exercise reduces levels of cardiovascular and sympathoadrenal responses during and after mental stress.

Geri B. Neuberger\textsuperscript{15} The effects of 12 weeks of low-impact aerobic exercise on fatigue, aerobic fitness, and disease activity were examined in a quasi-experimental time series study of 25 adults with rheumatoid arthritis (RA). Measures were obtained pre-intervention, mid-treatment (after 6 weeks of exercise), end of treatment (after 12 weeks of exercise), and at a 15-week follow-up. ANOVAs for repeated measures showed that those subjects who participated more frequently reported decreased fatigue, while those who participated less frequently reported an increase in fatigue. All subjects, on average, showed increased aerobic fitness and

\textsuperscript{15} Geri B. Neuberger, "Effects of exercise on fatigue, aerobic fitness, and disease activity measures in persons with rheumatoid arthritis", Abstract ,School of Nursing, 3901 Rainbow Boulevard, University of Kansas Medical Center, Kansas City, KS 66160-7502 : 9 December 1996
increased right and left hand grip strength, decreased pain, and decreased walk time. There were no significant increases in joint count or sedimentation rate. Significant improvements in measures at the 15-week follow-up also were found. Findings indicate that persons with RA who participate in appropriate exercises may lessen fatigue levels and experience other positive effects without worsening their arthritis.

Uppal and Rajendra Singh\textsuperscript{16} carried out a study on effect of training and break in training on flexibility of physical education majors. 28 boys and 13 girls physical education students of LNCPE, Gwalior were selected as subjects of the study randomly. Ten weeks of regular physical education classes with conditioning and games were carried out. Before and after the start of the classes sit and reach test, standing bobbing test, shoulder flexibility test, and spine flexibility test were conducted. Later four weeks break was given. After the break of four weeks, once again the same four tests were conducted to assess the effects of break. Results reveal that, regular physical education and conditioning programmes significantly improves the flexibility performance of men and women physical education students. The break

in the regular participation for four weeks significantly lowered the flexibility performance in both male and female subjects.

Ramesh Pal\textsuperscript{17} carried out a study to analyze the effect of aerobic training and anaerobic training on middle distance running performance. 100 boys schooling in class ninth and tenth was the subjects and were selected randomly. After confirming their medical fitness, they were randomly grouped in to five groups namely A, B, C, D, and E. Four groups were acted as experimental groups and one group acted as control. The experimental Groups were imparted training with different training regimen with aerobic and anaerobic training in different proportions. Group A trained with combination of aerobic and anaerobic training in the ratio of 70\% to 30\%, group B with 60-40\%, group C with 50-50\% and group D with 40-60\%. While group E acted as the control group. Aerobic and anaerobic training were imparted by using the ‘interval running of ‘extensive interval method’ and ‘intensive interval method’ respectively. The subjects were trained thrice a week on alternate days for duration of ten weeks. The performance of the subjects over a distance of 1500 meters run were recorded to the nearest 1/10\(^{th}\) of a second before and after the completion of experimental period. The

results reveals that, the different proportion of aerobic and anaerobic training employed in the ratio of 70-30, 60-40, 50-50, and 40-60 percents adopted in this study proved to be effective for improving the performance in 1500 meters run. The combination of 50 aerobic and 50 anaerobic proved to be most effective for improving performance in 1500 meters. There was no significant improvement found in control group could be due to inactivity.

Bera, Rajapurkar and Ganguly\(^{18}\) carried out a study on effect of yogic training on body density in school going boys. Forty male students of class eight was served as subjects, chosen randomly, and grouped in two equal size of experimental and control group. Body height and weight was measured and formed equated group of experimental group and controal group. One year span yogic training programme was given, for 3 days per week frequency. Body density, percent body fat, absolute fat weight and ideal body weight were tested before and after the training period. ANACO was performed to analyze the effects. The results reveals that, a significant improvement of body density was found in yoga group in comparison with control group. Percent body fat was gained significantly in control group in comparison with yoga group. Absolute

body fat of control group increased significantly than yoga group. Significant improvement in ideal body weight was found in yoga group that control group.

Atindra Barik and A.K. Banerjee\textsuperscript{19} carried out a study on effect of six weeks conditioning programme on some performance variables between tribal and non tribal students. For the purpose of the study 17 tribal and 21 non tribal students were selected. The variables measured were speed, endurance, explosive strength, agility and also blood sugar, percent hemoglobin, blood pressure, resting and exercise heart rate. All the variables were measured twice, before and after the training.

Non tribal students were found significantly better in explosive power and agility where as tribal were better only in speed. On physiological variables significant difference was observed in Hb\% and diastolic BP and the Tribal has the higher value. In Non tribal group only blood sugar level was decreased significantly. Following training the magnitude of improvement in endurance, explosive strength and agility was higher in tribal group and that of speed was highest in the tribal

Mathur and Kumar\textsuperscript{20} carried out an investigation on effect of four weeks endurance training at anaerobic threshold level in 12 to 14 years aged children. 36 healthy male students between 12 to 14 years of age were selected randomly and group in to two, one experimental and another one control. Experimental group subjects (n=18) were administered with 30 minutes of bicycle ergometer workout thrice a week keeping heart rate at corresponding to their personal AT level, where as control group (n=18) was not given any training. Mean values of VE max, VO\textsubscript{2}max, HR max, AT and the Lactate threshold point in both groups did not show any significant difference. It was observed that, short duration endurance training at selected AT level in children has no effect on the physiological characteristics and cardio respiratory fitness of junior level participants in endurance events.

Kalidasan and his associates\textsuperscript{21} investigated the influence of training with and without selected yogic practices on technical skill level among cricketers. Three matched groups each having 10 boys of 18 -20 years of age served as subjects. Group-I acted as control group, group – II was given training without yogic practices and group – III was given training with yogic practices. Training programme specially designed for cricketers and yogic practices were drawn. Training was given for 2 hours in the evening and yogic practices were given for 30 minutes in the morning for 6 days a week for a period of eight weeks. The pre and post tests conducted before and after the treatment respectively. The technical skill level of the players was subjectively rated by three qualified coaches. ‘t’ and ‘F’ tests were used to analyze the data. The result indicates that there was significant difference due to treatment in technical skill level in group – II and III. The result also indicates that there was significant difference among the three groups. The analysis showed that training with yogic practices improved the technical skill level.

Nageswaran, Sundaramoorthy and Subhasree\textsuperscript{22} carried out a study to investigate the effects of power resistance and combined resistance and plyometric training on strength parameters and speed. 45 male inter collegiate level players who participated in various sports, but who had not previously performed specific resistance or plyometric training and were assigned at random to one of the three groups (n=15) in which group-II underwent combined resistance and plyometric training and group-III acted at control. The training period for both the experimental groups was thrice a week for eight weeks in addition to their regular activities. Both training groups were equally effective in enhancing strength parameters and speed, when compared to the control groups. There was no significant difference between the experimental groups, but trends are in favour of combined training.

Sailendra Nath Maity and Subhash Chandra Samanta\textsuperscript{23} carried out a study on effect of calisthenics and yogasanas on motor fitness of fifth grade girls. For the purpose of the study, 90 fifth grade girls were selected randomly.


from three different institutions. All the subjects were equally divided into three equivalent groups on the basis of Oregon Motor Fitness test scores and allotted randomly to experimental group -1, experimental- 2, and control group. These scores served as pre test scores. Immediately after pre test, experimentation started for a period of twelve weeks on the following protocol. Experimental group – 1 was given with calisthenics table consisted of ten exercise namely jack jump step drill, side bending, forward bending, push ups, squat thrust, baithak, hip joint stretching, sit ups and quadrant jump. Experimental group -2 was given selective yogasana practice on alternate days for ten to thirty minutes per session for twelve weeks. Yogasana table consisted of Swasthikasana, Birasana, Uththista Padmasana, Bhujangasana, Ardhasalabhasana, Naukasana, Vriksahasana, Tadasana, Ardhachandrasana, Utkatasana, Bakasana, Sasangasanana, Ustrasana, and Sabasana. The control group was not allowed to participate any of the above two group activity, but allowed to take part in normal physical education classes. After twelve weeks of treatment each subject belong to three groups were being tested again on Oregon Motor Fitness Test and the scores were compared. The result reveals that, there was improvement of Motor fitness variables among both calisthenics and yogansana groups. Calisthenics exercise were found to be superior to yogasana in improving performance in each individual test items of Oregon Motor Fitness Battery except crossed arm cur ups.
Anita Tamarakar and Kanwaljeet Singh investigated the effects of weight training, plyometric training and their combination on the development of speed, strength and explosive power. The criterion measure was 50 yards dash, leg and back dynamometer and Sargent jump test respectively. 24 intervarsity level players from different sports and games were the subject of the present study. Four groups were formed on random with six subjects each, where three groups were experimental groups and another one was control. Three experimental groups were administered with three different training programme, viz., weight training, plyometric training and combination work for eight weeks and the control group performed the routine work. The data was collected in the beginning and at the end of the eight weeks experimental period in terms of pre and post test. The training schedule was prepared systematically and carefully keeping the individual differences of the subjects and loading principles in mind. ANCOVA and t-test was applied to find out the differences in pre and post scores of groups. The significance was tested at 0.05 level. It was found that, plyometric training has improved speed whereas weight training and combination training has shown no effect on speed. Combination training has not

increased leg strength but weight training and plyometric training have not contributed towards its development. None of the protocol has been proved to enhance explosive power.

Usha Lohan, Dolly and Rajesh\textsuperscript{25} studied the effects of Asanas and Pranayamas on Physical and Physiological components of boys between age group 12-16 years. The study has been conducted on 120 male students in the age group of 12 to 16 years. Four groups consisting of 30 students each were formed. This study examined which type of yogic group had the maximum effect on the physical and physiological fitness of subjects. Results showed that every type of yogic exercise improves the physical and physiological fitness but training of asanas and pranayamas collectively can produce the best results.

Kalpana Debnath and Gurdial Singh Bawa\textsuperscript{26} carried out a study to analyze the effect of eight weeks break in training on performance of physical abilities and competition performance in women gymnastics. 22 women gymnasts who attended six weeks coaching camp at the NIS,


Patiala were taken as subjects. The tests to measure physical abilities level such as chin ups on uneven bars, dips on parallel bars, rope climbing, raising legs on wall bars, and sit ups, standing broad jump, trunk flexion, and 30 meter sprint and gymnastics competition performance were administered on each subject at the end of the coaching camp. Again the same tests were conducted after training break of eight weeks on the same subjects. The results of the investigation have shown a significant decrease in physical abilities level, especially in arm strength, abdominal strength, and explosive legs strength, flexibility and competition performance scores.

Bhatia and Prem Lata\textsuperscript{27} carried out a study on effect of yogic exercises on balance and perception of college level female players. 40 female players of college level were divided in to two groups randomly, where one group was given with selected yoga asana programmes for a period of six weeks while another was a control group. The balance was measured before and after the experimental period of six weeks, by administering static balance, stork stand test, bass stick test (cross wise) and Bass Stick Test (length wise) and the modified Bass test of dynamic balance with the assistance was conducted. The distance perception test,

and the ball throw test was conducted to test the perception. The results revealed that the yogic exercises found to be effective to develop perception and balance.

Harkirnddeep Kaur, Mandeep Kang, and G.S. Kang\textsuperscript{28} carried out a study to investigate the effect of PNF stretching with moist heat vigorous running and brisk walking on hamstring flexibility. Stretching before and after participation, is the standard practice in sports. But stretching muscles in the cold condition does not help much in providing flexibility. Stretching immediately after the workout causes greater flexibility and also speeds up recovery. The purpose of the study was to compare the acute effects of four different stretching protocols on hamstring flexibility. A total of 20 healthy, unrelated normal individuals, 10 females and 10 males aged 18-24 years participated in the study. The same subjects were considered in the experimental design. Active knee extension before and after each treatment was measured for hamstring flexibility at first and fifth minute that is in cold state after moist heat application for 20 minutes after vigorous running (60-70 % heart rate reserve) for 4 minute and after brisk walking for 4 minutes. One way

ANOVA showed significant difference in four groups and t-test showed non significant differences in active knee extension, in control group. Significant differences in moist heat group at first minute, significant increase in active knee extension in vigorous running group at first minute and at fifth minute. In brisk walking group significant differences were found at first and non significant difference at fifth minute. It was concluded that stretching enhances hamstring flexibility, in cold state but when it was combined with vigorous running, it showed highly significantly increase in active knee extension at first and fifth minute, when brisk walking was done before stretching, significant increase in acute knee extension was also observed at first minute. Moist heat pack for 20 minute also enhances acute knee extension significantly at first minute.

Chandrakanth Mishra and Ramakanth Mishra carried out an investigation on effect of four week yogic exercises and four week detraining on selected fitness variables. The present study was carried out on 40 students of local public school. They undertook a total of four hours of yoga, six day a week, for four weeks. On the basis of fitness

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index points, the subjects were divided into two matched groups of 20 each. One of the groups was randomly selected as the experimental group and the other were treated as control group. No subject engaged themselves in competitive sports or other systematic training programme during experimental period, which could have influenced the result. Fleishman Battery of Basic Fitness Tests was administered on both the group before and after the period of exercises. Experimental group subjects were made to perform 40 minutes of yogic exercises every day. After the experimental period was over both the group were tested with same battery of test. In order to determine detraining effect of yogic exercise, the practice of the experimental group was discontinued for a period of four weeks. The experimental group was again tested with the same battery of tests in same manner as before. The data collected before, after and on completion of detraining period to the experimental was compared. It was found that, the physical fitness index shown greater improvement among experimental group in comparison with control group at fourth week. The comparison between post test and detraining test results depicted that there was non sustenance of the level of fitness after discontinuation of yogic practices for four weeks. However, the training effect was not completely lost at this point of time.
V. Amutha and V. Jayanthi\textsuperscript{30} carried out a study on selected yoga asana on anxiety, maximal oxygen uptake and flexibility among school boys. 50 male students were selected at random from various high school and higher secondary schools. The anxiety was measured by using IPAT anxiety scale. Maximal Oxygen uptake capacity was measured by administering Astrand-Rhyming Nomogram and the flexibility was measured by sit and reach test. Subjects were divided in to two equal groups. One was experimental group, with 25 subjects and the one was control with 25 subjects. Both the groups were tested before and after the experimental period. The experimental group underwent training for nine weeks, weekly five days, and control group did not do any special training. The result reveals that the anxiety decreases significantly and maximal oxygen uptake and the flexibility increased significantly.