CHAPTER II

REVIEW OF RELATED LITERATURE

The review related to topic, based on the articles of peer-reviewed journal as identified from electronic literature searches using MEDLINE, Hiwire press and SPORTDiscus data bases, is enumerated below.

Saez de Villarreal, Requena and Cronin (2012) assessed the sprint performance improvements after chronic plyometric training. For this purpose twenty six articles were reviewed and the results demonstrate that the improvement in sprint performance can be achieved through combination of different types of plyometrics that incorporate greater horizontal acceleration.

de Villarreal et al., (2009) analyzed fifty six studies to determine effect of plyometric training on improvement in vertical jump height performance. The results of this study indicate that the combination of squat jump, countermovement jump and drop jump could improve vertical jump height rather than using only one form of plyometric.

In another study Saez-Saez de Villarreal, Requena and Newton (2010) conducted a review of fifteen studies and found that strength performance can be improved with plyometric exercises and weight training.

Markovic et al., (2007) carried out a study to see the effect of sprint training on muscle function and athletic performance. The physical education students participated in this study were divided into three groups with thirty subjects in each group. (Gr. I Sprint group; Gr. II Plyometric group and Gr.III Control group). The results revealed significant improvement in almost all the selected variables among both the experimental groups. From the results it was concluded that sprint training produces greater training effects in muscle
function and athletic performance than conventional plyometric training. Further, this study recommends the use of sprint training method for improving explosive performance of athletes.

Makaruk et al., (2011) conducted a study with view to see the effect of unilateral and bilateral plyometric training on power and jumping ability in women. The subjects were divided into three groups unilateral plyometric training group, bilateral plyometric training group and control group. Before and after training peak power and jumping ability was assessed. The results suggest that unilateral plyometric exercises produce power and jumping performance during a shorter period when compared to bilateral plyometric exercises but achieved performance gains last longer after bilateral plyometric training.

The study was designed to determine the grip strength, flexibility, and endurance of 21 black SHS students at 3 different times during the menstrual cycle (Kridakorn 1974). The Ss were tested at 1 month intervals for 3 months on 3 physical performance tests: (hand dynamometer for grip strength, adapted Kraus-Weber floor touch for flexibility, and Harvard Step Test for endurance). Each S was allowed 3 trials in the first 2 tests. Scores were recorded to the nearest pound on the grip strength and the nearest 1/10 inch in flexibility. The arithmetic x and fitness index for each test were calculated and the Ss were divided into 2 groups, under 17 and over 17 years of age. The data were analyzed using 3-way ANOVA for a 3-factor experiment. The F distribution table was consulted for statistical significance at the .05 level. Differences in grip strength were found which were significant, with the strongest x scores occurring during the postmenstrual phase. No rhythmic variations could be established in this group of SHS girls. No interaction between the menstrual cycle, flexibility, and endurance were found.

Bowling Green State University women students (N=38) were subjects for this study (Fahlson 1974). The lecture demonstration group received
instruction by explanations given to the entire class as a group, supplemented by instructor demonstration. The mechanically oriented group received instruction given by slide sequences, supplemented by the instructor answering student questions. Slide sequences included explanations of mechanical principles related to the skills involved. All Ss were given a 5 iron test, 9 iron test, and putting test, and all played a 9 hole round of golf on a regulation course. Statistical results were analyzed to test the null hypothesis that there was no significant difference between terminal performances of Ss in the 2 groups. The raw scores were statistically treated by ANOVA. Reliability coefficients and predictions were calculated from the scores obtained. It was concluded that the lecture demonstration group and the mechanically oriented group using slide sequences were not significantly different (p> .05) on the performance of the composite 5 iron test or on each of the components of the 5 iron test (trajectory, distance, and accuracy), on the trajectory component of the 5 iron test, and on performance on 9 holes of regulation golf course play. The mechanically oriented group was significantly superior to the lecture demonstration group (p< .05) on the composite 9 iron test, the accuracy component of the 9 iron test, and the combined 3 ft and 15 ft putting test.

Johnson, Salzberg and Stevenson (2011) reviewed various articles with a view to evaluate the efficacy and safety of plyometric training for improving motor performance in young children. This review indicates that plyometric training in young children is safe and improves balance, agility, running and jumping performance.

The purpose of this study conducted by Bhavani (2006) was to examine the impact of certain asanas on cardiovascular efficiency and respiratory ability on twenty students studying in B. Com first year. First year student of S.V.T.E. Jamnagar were randomly selected as subjects. The asanas training was given for six week continuous to the selected group. Before and after six-week of training, the cardiovascular efficiency was
measured by Cooper 12 min/run and walk test and respiratory ability by Spirometer. The result revealed a statistically significant improvement.

Three diet programs, differing in type of carbohydrate or fat ingested, were crossed with 4 exercise programs, including normal activity and 3 forced exercise levels of 20, 40, and 60 min. (Alijanian 1974). Food consumption for the 8-week study was monitored and recorded, and beginning and end-study weights were taken. A fasting serum sample was analyzed by the Folch Method to assess cholesterol levels. At the .01 level, the following conclusions were drawn: daily exercise at study levels is effective in reducing body weight, serum cholesterol and amount of food intake, and regular exercise and amount of food consumed have a greater effect on body weight than on serum cholesterol.

Male 9th grade JHS students (N=10), age 14, who were considered behavioural and/or predelinquent by the school staff were placed in 2 groups: October to January, group A, and October to May, group B. Rosenberg’s Self-Esteem Scale, Bill’s Index of Adjustment and Values, and Schultz’s FIRO-B were administered as pre- and post tests and an ANOVA was used to determine significance at the .05 level (Anderson 1974). It was concluded that participation in a tutoring program for emotionally disturbed children had no significant measurable effect in the areas of self-esteem, attitude and values, and social interaction. It was also shown that attitude and value variables did change significantly, but only when the individual effect was considered. However, the exactness of the individual effect is questionable because there was no pattern to the tutor’s scores.

Morin, Edouard and Samozino (2011) tested the hypothesis whether the field sprint performance is related to the technical ability to produce high amounts of net positive horizontal force. The results of this study showed significant correlations between DRF and 100 m performance. In fact from the results it was concluded that force application technique is a determinant
factor for the 100 m sprint performance. Further, the orientation of the total force applied on the ground during sprint acceleration is key factor to improve performance than its amount.

Villarreal et al., (2010) investigated the influence of 8-wk periodized plyometric training on chair-rise, jumping and sprinting performance in middle aged women. This study involved a group of 55 women between the ages of 40 and 70 with no plyometric training experience. The results of this study recommends low impact plyometric training for optimizing vertical jump and chair rise test among untrained middle aged and elderly women.

Meylan and Malatesta (2009) determined the influence of a short-term plyometric training within regular soccer practice on explosive actions of early pubertal soccer players during the in-season. The results of this study demonstrated that a plyometric program with regular soccer practice improves explosive actions such as sprinting, change of direction and jumping in young players compared to conventional soccer training only.

Vissing et al., (2008) compared the changes in muscle strength, power, and morphology induced by conventional strength training vs. plyometric training. The results of this study revealed that gross muscle size increased both by plyometric training and conventional resistance training, while only resistance training seemed to increase muscle fiber cross sectional area. Both the training interventions improved maximal muscle strength, whereas muscle power increased almost exclusively with plyometric training.

Ss were selected (N=63) from jogging classes at Brigham Young University, and performed prescribed workouts of 2 minutes 4 days a week for 14 weeks. Twenty Ss jogged, 21 Ss walked, and 22 Ss were controls. Pre and post tests were max VO2, hydrostatic weighing, and McClay Strength Test for grip, leg, back and arm strength (Anderson 1974). ANOVA was done and significance was determined at the .05 level. A Newman-Keuls Sequential
Range test was also employed. It was concluded that both jogging and walking programs can increase total body strength. There were no significant changes in body composition as a result of either program.

Of the 256 people in the Orem/Provo, Utah area interviewed, 200 had chronic diseases (Anderson 1974). These data were stratified, tabulated, and subjected to a $\chi^2$ test to determine statistical correlations. The following conclusions were made based on the findings. Numerous nonsignificant relationships did exist between various chronic diseases and moderator variables. Chronic disease knows no age barrier; young and old can be afflicted alike. As educational attainment increased, the likelihood of not contracting a respiratory or degenerative chronic disease decreased. Length of residency in the Orem/Provo area had a definite effect on the incidence of chronic ailments. Visual impairments, asthma, hay fever, and allergies were the conditions of highest incidence in this study.

de Villarreal et al., (2008) examined the effect of 3 different plyometric training frequencies (e.g., 1 day per week, 2 days per week, 4 days per week) associated with 3 different plyometric training volumes on maximal strength, vertical jump performance, and sprinting ability. The results of this study demonstrated that a moderate volume is more efficient than a higher plyometric training volume.

The history and growth of sports in Brazil were examined (Figueiredo 1976). A brief history of Brazil and its development as a nation in a changing world is presented. The main points discussed are those concerned with governmental influence in the growth and development of sports. Included in this process is the role of sports in Brazilian culture. This research examines the importance of sports in Brazil's quest for international recognition. The philosophical concepts that have evolved are examined.
The Ss (N=173) were all enrolled in either conditioning, field hockey, soccer, volleyball, badminton, tennis, or golf at Skagit Valley College (Armstrong 1974). The data from 3 skill and 3 cardiovascular variables, 3 motor ability items, and 16 personality traits were analyzed for r, ANOVA, and multiple regression. It was concluded that cardiovascular endurance is not related to skill achievement in classes where learning sport skills are emphasized, and the prediction of skill achievement can be improved with the addition of the EPPS to the preskill test.

Curricula from 7 universities and junior colleges and classes from 15 universities and junior colleges were selected for consideration (Batty 1974). Program feasibility was ascertained by interviews with persons and employers whose occupations related to the suggested curriculum of motorcycle/snowmobile technician, recreation guide, and parks and recreation technician training. Cost feasibility was determined from a budget breakdown and a dollar-per-student expenditure construction based on Utah Technical College at Provo financial reports. Findings of the study suggested that a demand for a recreation technician trained by the suggested curriculum did exist both regionally and nationally.

The nature of nationalism and evidence of nationalism in international sport were examined (Levin 1975). An investigation was conducted to develop a theory of nationalism which established the following components of nationalism: fatherland, national identification, national unity, national prestige, national mission, national security, economics, communication, politics, and international relations. Upon this theoretical base, evidence of nationalism in sport was examined in 20th century international sport. An analysis of this evidence revealed the following conclusions; international sport priorities are reflected in national economics; international sport has been infiltrated by politics making it national policy; political leaders have discovered personal benefits from sport affiliations; Olympicism has illuminated the conflict between nationalism and internationalism; communication is vital to
nationalism in sport; and international sport is a symbol used to propagate nationalism and system priority.

The aim of this study conducted by Impellizzeri et al., (2008) was to evaluate the impact of plyometric training on muscle soreness, vertical jump height and sprinting ability, on sand versus a grass surface. Out of thirty seven subjects, eighteen subjects underwent a plyometric training on grass for four weeks while nineteen subjects completed it on sand. The results indicate that plyometric training on sand improved both jumping and sprinting ability and induced less muscle soreness. Further, it was seen that grass surface was superior in enhancing counter movement jump performance while the sand surface showed a better improvement in squat jump.

The 1972 Lincoln County HS varsity (N=22) and junior varsity football teams (N=22) were Ss. Criterion measurement was by the Self and Other Rating Scale given 4 times; first practice day, after the first win, first loss, and at the season’s end (Blad 1974). An ANOVA revealed that being a varsity team member did not produce better self-concepts than junior varsity players, being a starter on either team did not produce a better self-concept than a substitute, and participation in HS football did not contribute to an increase in self-concept.

A sampling of 209 women students, 125 athletes and 84 nonathlete controls was administered the Cattell 16 PF Form A between Jan and June 1974. One way ANOVA and t tests were calculated for the 16 variables, comparing personality traits of athletes with the random control Ss, and comparing each with national norms established by the Cattell 16 PF questionnaire (Brashier 1974). Team and individual-dual sport participants were compared to each other, the control group, and the national norms. A determination of district personality traits was also made. Two of 16 factors differed between athlete and control Ss (p<.05), control Ss differed on 7 of 16 traits (p>.05), and specific sport activities did not differ (p>.05).
This paper by Kharabe (2006) determines the relative aspects of Yoga in Physical Education & Sports. In fact, Yoga is one of the ancient Indian spiritual sciences, which aims at highest spiritual development of sadhaka. Yoga is considered as a system of Mental, Physical and Spiritual Development. Yogasana are simple action for keeping the internal & external parts of body. In good health the body & mind are closely interrelated. Ancient Greece believed in the principle- “A sound mind in a sound body.” Now a days physical education is must for each & every person & in that yoga is an indivisible part and important aspect. As compare to physical exercise, yoga provides sufficient exercise to internal organs as well provides mental peace. With reference to the above, the author concludes that - 1) Yoga gives sufficient exercise to the internal organs of the body and consequently an individual can maintain good health & longevity of life, and Yogasanas have a greater impact on the mind & the senses than any other physical exercise. Yogasanas help to develop ones physical & mental powers to enable us to meet the challenges of the modern life, most efficiently and effectively.

This thesis examined the concept of culture and developed a synthesis of essential components categorized as the: nature, universals, processes, and dynamics of culture (Lupcho 1977). The 1\textsuperscript{st} category reveals the paradoxical essence of culture; the 2\textsuperscript{nd} encompasses elements common to each diverse culture; the 3\textsuperscript{rd} includes those elements related specifically to development of the individual within a culture; and the last presents the processes by which cultures change. Thus, a theoretical base was established through which sport as a function of culture was examined. Evidence of sport from a cultural perspective revealed the normative and structural relationship distilled from the ongoing cultural processes resulting in that human behaviour identified as sport. This evidence demonstrated the inextricability of sport and culture as an abstraction and as operant social behaviour, and further revealed that sport exists only when the normative base of culture incorporates value orientations inherent in sport.
The Beusay Exp survey of Temperament was used to identify 5 traits: persistence, competiveness, confidence, mental toughness, and self-control. Basketball players (N=18), gymnasts (N=9), swimmers (N=9), and track and field competitors (N=21) were compared to a general population (N=422). No significant differences were found among the small groups (Tomocik 1975). Basketball, swimming and track and field athletes were lower (p<0.05) than the general population in competiveness; basketball and track and field, lower (<0.05) in mental toughness; and gymnasts higher (p<0.05) in persistence.

The aim of this study conducted by Sato and Mokha (2009) was to assess the impact of six weeks of core strength training on ground reaction forces, stability of the lower extremity, and overall running performance. The results of this study showed that six weeks of core strength training is effective in improving 5000 m run. However, core strength training had no significant effect on ground reaction force variables and lower leg stability. Nevertheless, the results shows that core strength training can be used to improve performance in runners.

Kubo et al., (2007) investigated the effects of plyometric and weight training protocols on the mechanical properties of muscle-tendon complex and muscle activities and performances during jumping. The results revealed that the jump performance improvement after plyometric training are attributed to changes occurred in muscle-tendon complex, rather than to the muscle activation strategies.

The Allport, Vernon, and Lindzey Study of Values Test was administered to male (N=20) and female (N=22) varsity and jr varsity college basketball players (Walley 1976). The t-test of significance was used to determine significant differences (p<0.05) for the subcategories; theoretical, economic, aesthetic, social, political, and religious. The women scored significantly higher on the social sub-category; the men scored significantly higher on the political sub-category.
To determine the relationship of key factors in basketball (field goal attempts, field goals made, free throw attempts, free throws made, total rebounds, and home court advantage) to winning, the 1971-76 basketball seasons of teams in the Western Athletic Conference were studied (Asmussen 1976). Each category studied, except for home court advantage, was evaluated by the t-test. The relationship of home court advantage to winning was evaluated by the $\chi^2$ technique. The 0.05 level of confidence was selected. Conclusions were: field goals made, free throws attempted and made, total rebounds and home court advantage were all significant to winning; each of the 8 conference teams had at least 1 of the 6 key factors significant to winning; and total rebounds and free throws made were significant to winning more often than any of the other selected factors.

To determine if there was significant differences in certain personality traits between those who participated in high risk vs. Low risk sports at CSU during Spring Quarter, 1975, and to determine if there were significant differences in the same personality traits between those who did travel vs those who did not travel to represent CSU in intercollegiate competition (McCluskey 1975), The Personality Research Form A was administered to 18 female tennis players, 4 male tennis players, 4 female ski-racers, and 11 male ski-racers. A 2-way factorial design was used to determine if any significant differences (0.05 level) existed between each group. The selected personality traits were found for neither the high risk vs low risk group, or the travel-no travel group. The aggression trait in the travel-no travel segment did approach significance.

Markovic et al., (2007) evaluated the effects of sprint training on muscle function and dynamic athletic performance and compared them with the training effects induced by standard plyometric training. From the results it was concluded that short-term sprint training produces similar or even greater training effects in muscle function and athletic performance than does conventional plyometric training. This study provides support for the use of
sprint training as an applicable training method of improving explosive performance of athletes in general.

Kotzamanidis (2006) investigated the effect of plyometric training on running velocity and squat jump in fifteen prepubescent boys. The plyometric exercise training was administered to experimental group for 10 weeks while control group followed the physical education program. Results showed statistically significant difference in running velocity and squat jump performance in control and experimental groups. These results indicate that plyometric exercises have positive influence on squat jump and running velocity performance in prepubertal boys.

The development of the proposed curriculum involved extensive study of relevant literature through library technique, visitation to different universities in the U. S. , discussion with PE specialists, and letter writing to Tanzania, Africa, to obtain information necessary for the study (Dusara 1974). The members of a panel of experts unanimously expressed the opinion that the proposed curriculum was meaningful, relevant, and valid for implementation. It was concluded that this curriculum is effective and feasible for the preparation of PE teachers at the University of Dar Es Salaam, and the implementation of this program will provide the youth of Tanzania an opportunity to develop well-rounded personalities in a series of systematic experiences in PE.

This study examined the factors and qualities that characterize CO Northern Conference HS basketball officials, and obtained information from the state HS activity associations concerning characteristics and criteria for an on-going evaluation of basketball officials in their respective states (Mcnulty 1976). 15 officials were given the 16 PF Questionnaire, Form A. In addition, a questionnaire was sent to the executive officers in the 50 state HS basketball associations requesting information on the no. of basketball officials in each state, type of rating system used, requirements for certification, and
requirements for maintaining the status of a certified official. The statistical analysis supported the hypothesis that there was no difference in personality traits between high, low, and least known officials. The results of the questionnaire supported the conclusion that state HS associations should, in conjunction with the National Federation of State HS Associations, cooperatively establish standard officiation procedures, rules interpretations, rating and certification standards, and evaluation procedures to eliminate the vast disparity that now exists among the states.

The Athletic Motivation Inventory and Cattell’s 16 PF were administered to the top 13 intercollegiate basketball players at Boise State University during the spring of 1976 to determine if there are personality trait differences between men and women basketball players at the college level (Montgomery 1976). The raw data from both tests were compiled and computer programs run to tabulate correlations and t-values for the AMI and Cattell’s 16 PF. The results of this study showed that for the traits of drive, aggression, determination and self-confidence on the AMI, significant differences were found between men and women basketball players at the 0.05 level. There were no significant differences found for the traits of guilt-proneness, leadership, emotional control, mental toughness, coachability, conscientiousness, or trust on the AMI. The results on the 16 PF revealed significantly higher scores for men on Factors E (humble vs assertive) and H (shy vs venturesome). The correlation matrix revealed significant relationships between all of the traits on the AMI with factors on the 16 PF except coachability.

Berryman, Maurel and Bosquest (2010) compared the effects of two strength training methods on the energy cost of running. Thirty-five moderately to well-trained male endurance runners were participated in this study. The subjects were randomly divided into either a control group or an intervention group i.e. plyometric and dynamic weight training. The results of
showed that plyometric training was more effective than dynamic weight training in improving energy cost of running.

Ross *et al.*, (2009) examined the independent and combined effects of resistance and treadmill sprint training on maximal sprint velocity and power. Twenty-five male athletes with average age 19.8 were divided into three groups (Gr.I Sprint training; Gr.II Resistance training & Gr. III combined Sprint & Resistance training). The training was given for seven weeks. The results showed significant improvement in 30 m sprint performance among sprint training group as compared to other two groups. Further, all the three groups showed significant increase in treadmill sprint velocity. The results of this study showed that 7 weeks of sprint training on a treadmill resulted in significant kinematic and kinetic improvements in sprint performance.

Varsity baseball coaches (N=74) in randomly selected SHS in IL were surveyed to investigate the relationship between the use of selected hitting drills to team batting average (TBA) and to determine the contribution of each hitting drill to X TBA (Sherwood 1976). Sub purposes involved determining the hitting drill that varsity baseball coaches used most frequently and the % of hitting practice that was devoted to each of the hitting drills. The following conclusions appear warranted. There was a slight r between the selected hitting drills, Down Swing and Hitting the Curveball, to TBA X. Some of the selected hitting drills seemed to measure the same aspect of what was being measured by about 21% of what was being measured by TBA X. All 11 selected hitting drills contributed less that 50% of what was being measured by TBA X. Over 50% of the TBA X must be attributed to something other than the contribution of the selected hitting drills. The selected hitting drill, Pepper, was most frequently used by varsity baseball coaches in IL, accounting for over 11% of hitting practice.

Subjects were 14 skilled and trained females with a mean age of 12.4. Subjects completed two 5 min rope skipping tests at cadences of 125 and 135
55

turn/min. Vo2 and heart rate were measured during work (Eifel 1982). Metabolic equivalents, kcals, and volume expired were calculated. A 2x3 factorial ANCOVA with repeated measures on 1 factor was used to test for significant difference between cadences and ages. No significant difference existed between the physiological response recorded at either cadence. Vo2 was 1.64 and 1.60 l/min for the 125 and 135 cadences respectively. When adjusted to body weight, vo2 values were 35.99 and 35.55 ml/kl/min for the 2 cadences. These values were consistent with the 60-90% recommended for cardiovascular benefit, as compared against max values in samples of similar age. HR was 192 and 193 bpm for the 125 and 135 cadences. When compared to the same samples, HR response was 93-104% of max values reported. The near max response may be due to the arm component of the activity. Energy cost was calculated at 10.3 and 8.16 kcals/min at the 125 cadence and 10.2 METS and 7.99 kcals/min at the 135 cadence. Energy costs were less significant that those reported in adult samples. No significant difference existed between the chronological age groups, between 11 to 13 yrs. It was concluded that rope skipping for 11 to 13 yrs old skilled females with cadences of 125 and 135 turns/min was an appropriate activity for participation, and that children less skilled in the activity may produce a more severe response than the sample studied.

de Villarreal et al., (2011) examined the impact of five different stimuli on jumping ability and power production after 7 weeks of training. The results of this study indicate that both traditional slow velocity training and faster power-oriented strength training alone, or in combination with plyometric training, could provide a positive impact on jumping performance.

Spurrs, Murphy and Watsford (2003) examined the outcome of plyometric training on running performance. The results of this study clearly demonstrated that a 6-week plyometric exercise training programme led to improvements in 3-km running performance and there were no corresponding alterations in VO(2max) or lactate threshold.
Selected max and submax physiological responses of females to an 8 wk rope skipping program were studied. Changes in HR, Bo2, and body composition were evaluated (Morehouse 1982). Subjects were 16 females, aged 18-17 yrs, 8 serving as control group and 8 as the experimental group. Subjects performed a continuous max treadmill test and two 5 min submax rope skipping tests prior to training, with skipping cadences of 110 and 135 turns/min. a modified jump rope was used to allow for direct measurement of Vo2. HR and Vo2 values were recorded and skinfold measurements were taken. After pre testing, the EG participated in an 8 week interval program 3 days/week. Total skipping time increased weekly and varied between 15-30 min per session. Both groups were tested again following the 8 weeks. Variables were analyzed using 2x2 factorial ANOVA and the Tukey post hoc tests. No significant (p> 0.05) changes occurred in vo2 amx following the 8 week program for either group, but the experimental group showed a significant decrease in submax HR response at the 135 cadence, indicating that training increased the efficiency of the cardiovascular response to submax work. No significant changes in vo2 or HR occurred in the 110 cadence. This speed appeared to be mechanically inefficient. Lean body weight, total body weight, and percent body fat remained relatively constant. Observed lack of significant in experimental group HR, submax vo2 and vo2 max values may be due to small sample size. All subjects had a high level of fitness, which may have limited the amount of change. Findings indicate rope skipping training is not an effective exercise for subjects with high initial levels of fitness.

Maintenance of cardiorespiratory fitness and body composition were investigated with 25 college age volunteer subjects from the population of students enrolled in fitness and conditioning classes (Dufek 1982). Subjects participated in personal fitness program for a minimum of 6 weeks during class and were retrained for 4 weeks at an intensity of 75% duration of 30 min, and frequency of 5 days/week prior to treatment. Pre tests consisted of a 12 min run and vo2 max bicycle erogometer test to evaluate cardiorespiratory
condition. Skinfold measures and body weight were recorded to evaluate body composition. The exp phase consisted of various frequencies of training on a bicycle ergometer with an initial intensity of 75% and duration of 30 min. Subjects were randomly assigned to one of 4 exercise frequency groups: 5, 3, 2 or 1 day/week. The maintenance period consisted of 7 weeks. Subjects were post tested with the same tests as the pretest. MANOVA and univariate tests were performed with the independent variable of treatment and dependent variables of pre post gain scores of the 4 measures taken.

Stemm and Jacobson (2007) compared the vertical jump performance after land- and aquatic-based plyometric training. The results showed significant improvement in vertical jump performance among both the groups.

Zamani et al., (2010) determined the effect of plyometric training on knee proprioception. The results of this study demonstrated significant improvement in knee proprioception following plyometric training. In fact, proprioception is very important for preventing undesired joints as it plays a protective role in injuries.

Raghavalu (1990) conducted a study to find out the effect of plyometric exercises on physical fitness components. The one hundred male subjects aged 15-17 years were divided into experimental group (n=50) and control group (n=50). The plyometric exercise training was administered to experimental group for total period of six weeks. At the baseline and after completion of experiment all the subjects were assessed for power, speed, agility and flexibility test. The results of this study revealed that plyometric exercises have positive effect on physical fitness component.

This study was concerned with the implications for professional preparation of sport administrators in Brazil, based on investigation of duties performed by sport administrators of selected sport associations of the St of Sao Paulo, in that country (Medalha 1982). Subjects (n=37) were interviewed
using a questionnaire which contained 91 duties divided into 10 categories. The subjects were asked to identify duties performed in terms of frequency occurrence and to rate the level of importance and difficulty of the duties. Respondents identified their reasons for rating the duties at extreme or considerable levels of difficulty. Data gathered were analyzed through descriptive statistical techniques generating frequencies, mean ratings, rank orders, model scores, and percentage presented in tabular form. The administrators performed more than 70% of the duties listed on the questionnaire, on an independent or cooperative basis. Duties were rated as being considerably important, and moderately difficult to perform. Lack of time, finances and experience were problems most often encountered by the subjects. Sport administrators investigated perform a wide variety of duties, which are of considerable importance and moderately difficult to perform. Administrators should be properly prepared through specialized interdisciplinary programs. Emphases should be placed on an academic background in PE and sport, and on related curricula and experiences in administrative and managerial procedures. The findings provided the basis for the suggested curriculum comprising 11 required and 9 elective course areas for the training of sport administrators in Brazil.

6 male and three female volunteers underwent testing for max HR and max vo2. Each subject then skipped rope for 5 min. at each of the rates 90, 120, 150 and 180 turns per min using a running style (Coccagna 1981). Collections for HR and O2 consumption were made at the 5th min. A comparison of the HR-VO2 relationships between treadmill and rope skipping exercise revealed no significant in slopes ($p > 0.05$), but values for HR were higher for RS than TM at the same relative O2 uptake. Regression equations for TM and RS were: HR predicted TM= 1.27 RVO2 + 62.71 and HR predicted RS= 0.81 RVO2 + 111.72, respectively. The caloric requirements for Tm increase with increases in HR but for RS remain the same regardless of increases in HR. The HR and VO2 are linearly related with respect to increases in skipping rate, but the relationship has minimal slope. Regression
equations for HR and VO2 were: Relative HR predicted RS = 0.05 tpm + 81.07 and relative VO2 predicted RS = 0.08 tpm + 58.83 respectively. The treadmill energy expenditure relationship can be used in predicting RS rates for skipping for training intensities in the range of 63 to 75 % max Vo2.

Kumar (1992) carried an experiment to see the effect of plyometric training and skipping exercises on the high jump performance. For this study ninety school boys were selected. The age of the subjects was 14-16 years. He divided the subjects into plyometric training group, skipping exercises group and control group. The experimental groups were given experiment treatments and the third group was treated as control and was not allowed to participate in any training intervention for a period of six weeks duration with thrice in a week training. The plyometric group was given depth jump from 40 cm box for first 3 weeks and from 50 cm box for the last 3 weeks. For skipping exercise group, skipping with high knee action and skipping with double leg were given. The following are the conclusions of his study.1. There was significant improvement in high jump in the two experimental groups due to plyometric training and skipping exercises 2. There was no significant improvement in high jump performance in the control group. 3. The plyometric exercises and skipping exercises had great effect on the beginners.

Data were collected from 54 male and 53 female athletes using the work and family orientation questionnaire (Helmeich & Spence 1978) and the survey of Interpersonal Values (Gordon 1976). Additionally, each head coach ranked all team members form most valuable to least valuable. This served as the dependent variable (Lidstone 1982). Also, 13 skill related indices were obtained for each player from 1981-82 cumulative statistics. Findings were as follows: Two sample t-tests revealed that male and female athletes differed on only 2 of 10 psycho-social variables. Female athletes obtained higher support scores and lower conformity scores. Multiple regression analyses indicated that psycho-social variables accounted for only 20.1% of the variability for males (support, benevolence, recognition, personal unconcern and work) and
24.7% for females (benevolence, competitiveness, recognition, support, work and conformity. When skill related variables were added, points per game, assists per game, rebounds per game, field goals attempted, work, recognitions, field goals made % of games played, support free throw % and personal unconcern explained 87.2% of the variability for male athletes. For females, points per game, assists per game, mastery, personal unconcern, % of games played, and field goals made accounted for 74.9% of the variability in MVP.

Voight and Draovitch (1980) have suggested some general guidelines, to be followed by athlete and instructor before plyometric training can be initiated.

They are:

1. Plyometric training should be specific to the goals established for the athlete.
2. Sports skills should be broken down and trained in their smaller components, and then rebuilt into coordinated movement pattern.
3. The quality of work is more important than the quantity of work.
4. Greater the amplitude of intensity, greater the recovery time.
5. Plyometric training may have the greatest benefit at the conclusion of the normal work out or practice session. It is recommended that only low to medium stress plyometrics be used at the conclusion of a workout due to the. Potential of injury with high stress or shock method plyometrics.
6. When' proper technique can no longer be demonstrated, maximum volume has been archived and the exercise must be stopped.
7. In the preparatory phase, exercise of low motor complexity and intensity should dominate. In the competitive phase, exercise of higher motor complexity and intensity should dominate.

8. In the competitive phase, exercise of higher motor complexity and intensity should dominate.

9. Plyometric training sessions should be conducted no more than three times a week during preparatory phase and two times a week during the competitive period.

10. Volume will prevail in the preparatory period with intensity becoming more important during the competitive period.

11. The plyometric training programmed should be progressive in overload.

12. Dynamic testing of the individual on a regular basis will provide important motivational feedback as well as feedback as to the progress of the plyometric programme.

Mullai (1987) conducted a study on the effect of selected plyometric exercises on the performance of long jump. With two groups of subjects, each group consist of 35 male school students. The groups were designated as experimental and control groups. The experimental group was given experimental treatment with selected plyometric exercises after taking pretest scores of the group. After a period of 6 weeks training with three times a week post test was conducted. The control group was not given any training. After the conclusion of the experiment the following conclusions are drawn by the investigator.

The initial and final mean values of performance in long jump of the experimental group are 358 and 378 respectively which indicated
improvement in the performance in long jump. The mean difference between the initial and final values of performance was 20.

The initial and final; mean values of the long jumping performance of the control group are 332.7 and 344.4 respectively. Which indicate improvement in long jumping performance. The mean difference between the initial and final values of jumping performance was 11.7.

The statistical analysis of the data regarding the experimental group showed a mean difference of 20. The standard deviation and "t' ratio of jumping performance are 8.124 and 7.78 respectively. Therefore the t – value is highly significant at the .01 level of confidence with nine degrees of freedom. The statistical analysis of the data regarding control group showed a mean difference 11.7. The standard deviation and t-ratio of long jumping performance was 8.94 and 4.14 respectively. Therefore the t-value was significant at the rate .01 level of confidence with nine degrees of freedom. The statistical analysis of the data regarding control group showed a mean difference of 11.7. The standard deviation and t-ratio of long jumping performance was 8:94 and 4.14 respectively. Therefore the t-value was significant.

Polhemus et al., (1980) studied the effects of weight training versus the effect of weight training and plyometric training with ankle weight and vest weight drills on performance of men athletes (track and field) in the vertical jump, standing long jump and 40 yards ash. For this purpose the subjects were divided in to two groups 13 in control group 14 in test group. Control group was trained with weight t5raining as well as plyometric drills. The weight training programme for both groups consisted of % mile jog flexibility exercises and 30 sit-ups, 1x5 pull ups, leg extension and leg out,

Bench press       5x5    65-75 % maximum effort
Power clean       5x5    65-75% maximum effort
Half squat  
5x5  65-75% maximum effort

Military press  
5x5  65-75% maximum effort

Maximum weights were lifted when maximum efforts were accorded, a pyramid programme was used:

65% max x 5 repetitions, 80% x 3 repetitions, 90% x 1 reputation, 100% x 1 reputation and 105% x 1 reputation. After maximum, the efforts were recorded, no more exercise was done on that day. For that next week three sessions the a65-75% - 5x5 reputation gradient stair step method was used. For example, as athlete who attained 100 lb maximum, the next three sessions The plyometric drills are 1. calling "running drill ". A 2 ½ lb ankle weight would be

70% x5 repetitions ( i.e. 70 lb x 5 repetitions)

75% x 5 repetitions ( i.e. 75 lb x 5 repetitions)

75% x 5 repetitions (i.e. 75 lb x 5 repetitions)

75% x 5 repetitions ( i.e. 75 lb x 5 repetitions)

Plyometric drills were done after weight programme was concluded by test group each day. Frequency of training programme was 3 days per week per six weeks. Naturally Weights and drills were done Monday, Wednesday and Friday. The only difference between the control group and test group programmes was the performance of two plyometric drills by the test group.

The plyometric drills are 1. Calling "running drill ". A 2 ½ lb ankle weight was secured to each right and left foot. The subject then ran in place with, emphasis on high knee lift and relaxation as well as a good running style. A total of 5 sets of 30 second drill were done. A 30 second recovery period between the sets was used. Drill 2." the vest weight" drill. This plyometric drill was used in prescribed manner 10-12% of body weight loaded in to vest.
Then 3 sets had one minute rest. From the result of the study the investigator draw the following conclusions.

1. Though both groups improved, a greater rate of improvement was recorded by the test (plyometric drill and weight training) group. Only test group showed statistically significant improvement.

2. The time element should be of no problem as drills took only 8 to 9 minutes 3 days a week, a total work seek of 24-27 minutes.

3. As for as injuries are concerned, there were no injuries recorded in the test group and in control group.

Satyanarayana Reddy (1993) conducted study with 45 school boys aged 15 to 16 years. He dived the subjects into three equal groups (n=15) and gave experiment to group one and two by keeping the third group as control group. Group one has undergone plyometric training, group two Wight training followed by plyometric training and the control group was kept away from experimental treatments. The purpose behind his study was to find out the relative effects of speed, average stride length and frequency of stride. After 12 weeks of training plyometric training and weight training followed by plyometric training on power, with thrice in a week he concluded the following through his experiment.

1. Power was significant difference existed between the two experimental groups.

2. Performance in speed was also improved significantly by plyometric and weight training followed by plyometric group when compared to control group, and no significant difference existed between the two experimental groups.

3. As for as average stride length is concerned, weight training followed by plyometric training group improved significantly when compared to
control group, and no significant difference existed between plyometric group and weight training followed by plyometric group and the control group.

4. In the average stride frequency, there was no significant difference between any paired groups i.e. plyometric group and weight training followed by plyometric group and by plyometric group and the control group, and weight training followed by plyometric group and the control group.

Traditionally meditations are being always considered having great effect on Stress Management or Anxiety Control. This notion and believe is also increasingly finding acceptance among scientific community, and acceptance is based purely on validation through research findings. Plenty of research work has been conducted worldwide on Transcendental Meditation. The most popular variant of meditation was founded by Maharishi Mahesh Yogi. This study was confined to transcendental meditation in relation to sports anxiety (Sanotra 2006). Forty University level sportsmen who were selected for various university team comprising of Basketball, Judo, Volleyball were acted as subjects for the study. The subjects were equated into two equal group on the basis of pretest record of Sports Competition Anxiety Test of Rainer Marten. One of the groups acting as experimental group while the other was control group. Experimental group was oriented and practiced meditation for 20 minutes daily for 6 weeks. Meditation group was thoroughly trained with basics of Transcendental Meditation and methods to be followed while practicing. The findings of this study indicate that practice of Transcendental Meditation for 6 weeks duration helped to reduce sport competition trait anxiety.

Verkhoshansky and Chornovsov (1975) carried a study to see the difference between short and long jump exercises in speed and the level of power. For this purpose 3 groups were selected, group one was trained with
'short' jumps (variants of single take-off one or both legs and variants of three and five jumps standing position) group two was trained with 'long' jumps (series of jumps using one leg and changing legs over 30, 60, 100 meters and more). The difference between these two groups was that there was a maximal and intensive take-off in the first group, whereas there was an adjustment to maximal speed of the movements in this repetition of second group. The groups were tested over the distances of 30, 60, 100 meters with flying and crouch start, distance of long and triple jump and a series of 10 jumps, time of bounding over 50 meters, as well as the number of running strides in place with 10 seconds. The results showed that the 'short' jumps considerably improved speed in runs with a crouch start up to 30 meters and the 'long' jump provided considerable changes in long as well as short distance with flying start. Further experiment was conducted to find out the effect of combination of 'short', 'long' and combination of 'short' and 'long' jump exercises respectively. Training period lasted for 9 months. To control the changes in running speed and specific power, 18 tests were conducted.

The conclusions of their study are:

1. Single and 'short' jump exercises mainly influence the development of acceleration at the short. Also, they help to have an increase in stride length and the run of 10 strides with start as well as an increase in stride frequency.

2. 'Long' jump exercises contribute a great deal to an increase in maximal speed endurance. In this respect bounding over 50 meters with time trials are particularly effective. The combination of 'short' and 'long' jump exercises in training offers the great training effect and a simultaneous development of specific power abilities in sprinting.

Adams (1984) conducted a study to determine whether significant gain in muscular leg strength and power could be achieved by jumping from heights ranging from .75 meter to 1.5 meters. For this 177 male and female junior' and senior high school pupils in the age range of 12 and 17 served as
subjects. The students were divided into six groups. The groups performed
depth jumps from various height (group one from .75 meter, group two from
1.5 meters, group three from 0.61 meters, group four from 1.22 meters, group
five control and group six participated in vigorous activities including jumping).
Vertical jump test was used to measure each subject’s ability to raise his/her
center of gravity and standing long jump was used to measure the power of
leg in jump forward. The results of this study indicates that depth jump from
.75 to 1.5 meter was not significantly effective in developing muscular leg
power.

Raghavalu (1990) conducted a study to find out the effect of plyometric
exercises on physical fitness components- power, speed, agility and flexibility
with 100 male students 15-17 years sample. He divided the subjects into two
equal groups (n=50) group one experimental group and group two control
group. The training schedule was from Monday to Friday for a period of six
weeks. The experimental group was given hopping, bounding, depth jumping
and throwing drills as plyometric exercises. After the experiment, the
investigator concluded the following from his study:

1. Plyometric exercises have positive effect on physical fitness
   component, power as the obtained F ratio of 100.8 is significant at .01
   level, assessed through standing broad jump.

2. Plyometric exercises improve the physical fitness component of speed,
   as assessed through 50 yard dash on experimental group as the
   obtained F ratio of 227.13 was significant at .01 level of confidence.

3. Plyometric training on experimental group showed significant
   improvement on the physical fitness component agility as assessed
   through 6x10 meters shuttle run (F = 210.83).

4. Ratio of 157.84 which was significant at .01 level obtained by analyzing
   the control group and experimental group proved, that physical fitness
component flexibility also improves significantly through plyometric exercises. The training schedule was from Monday to Friday for a period of six weeks.

Dursenev and Raevsky (1979) conducted a study to find out if purely eccentric equal groups (n=50) group one experimental group and group two control group. Exercises (i.e. without transition to concentric work) would facilitate growth of super maximum strength (MS). The experiment showed that exercises in which, muscles under the influence of external forces are forced to execute only eccentric work. These exercises definitely facilitative growth in SMS, simultaneously they provide growth of the greatly accepted MS. Also they conducted a study to establish what height of depth jumps would provide the best increase in strength. For this, one group executed depth jumps for their maximum height 2.8 to 3.2 meters, the other group jumped from a height of 2.2 to 2.6 meters. From the results of the above experiment they drew the following conclusions:

1. Depth jumps, in which the muscles under the influence of large external execute only eccentric work (in which there is maximum tension for the short time), facilitate the growth of strength during the dynamic regimens both in eccentric and concentric.

2. For strength development, the main consideration apparently is not the fact of the contraction or stretching of the working muscle, but the degree of intensity and the speed of the contraction evoked by the exercise.

3. Depth jump can be utilized in the strength training of jumps using an approach. equal groups (n=50) group one experimental group and group two control group. equal groups (n=50) group one experimental group and group two control group.
Suresh Doss (1992) studied the influence of step up and bounding exercises on the sprinter performance. For this study he selected 90 school boys 14-15 years age and divided the subjects in to 2 equal experimental groups and assigned step up exercise to one group and bounding drills to another group. Both the groups were given training for week, three times per week. From his study he concluded the following:

1. It was proved that there was significant improvement in the performance 100 meters sprint through step up experimental group and bounding exercise group.

2. Step up and bounding exercises improved the sprinting ability.

3. It was also proved that the mean gain of experimental group two (bounding) has greater that their experimental group one (step up). Hence bounding exercises have more effect on the performance in 100 meters sprint than step up.

Ford et al. (1983) examined the effects of three combinations wrestling, soft plyometrics in combination with other activities can be useful as a physical ball and plyometrics, weight training, and weight and plyometrics on physical fitness items. For this purpose 50 this high school boys participated for 10 week in one of the three programmes. They found out that weight training and fitness training procedure.

Balachandran (1989) conducted a study to find the effects of plyometric training on the volleyball players vertical jumping ability with 60 male school boys equally divided them in to experimental and control groups (n=30). The experimental group was given the treatment of experiment depth jumping exercises for duration of 6 weeks. From his study he drew the following conclusions.
1. Strength gains in lower extremities as a result of directed depth jumping exercises significantly improved the vertical jumping performance.

2. The significant differences found between the experimental group and control group the T ratio of 4.79.

Blattner and Noble (1979) carried a study on 48 volunteer male subjects to see the effects of isokinetic and plyometric exercise training on vertical jumping performance. The subjects (N=48) were randomly assigned to one of the three groups(n=16) group one was trained with isokinetetic exercises, group two was the control. Subjects in the training group were trained three times a week for eight weeks ..The isokinetic group performed 3 sets of 10 repetitions per set of depth jumps from a height of 34 inches with added resistance beginning with weeks 3,5 and 7 of 10,15 and 20 pounds respectively prior to and at the end of training period, all the subjects were given a vertical jump and reach test. Covariance analysis was used to compare post-test scores with the effect of pre-test differences removed. Results showed both training Groups improved significantly in vertical jump capacity, however, no significant difference existed among the training groups.

Pen (1989) compared the effects of depth jumping and vertical jumps combined with other types of training on vertical jumps and shot put performance. For this purpose, 39 college students were randomly assigned to one of the three groups. Group one performed vertical jump up to a height of 90 ems, group three(control group) performed maximum vertical jumps. Subjects in each group were training with respective programmes two times a week for a period of 12c weeks. Prior to and at the end of training period all subjects were tested on vertical jump and shot put performance. The results showed that all groups improved significantly in vertical jumping capacity. Further, the subjects of the two experimental groups also improved their shot put performance.
Polhemus and Burhardt (1990) examined the effects of plyometric training drills on strength gains of college football players. Plyometric exercises including depth jumping from a height of 45 cms were used in conjunction with weight training over 6 weeks. For this group one performed only conventional weight training exercises, group two performed weight training and plyometric exercises and group three performed weight training and undertook plyometric drills while wearing ankle weights. Each group was assessed on its performed weight training and undertook plyometric drills while wearing ankle weights. Each group was assessed on its performance power clean, bench press, half squat and military press. The results of the study showed that group three weight training and plyometric drills with ankle weight significantly (.01) improved in all four tests.

Crowder et al., (1993) conducted a study to test the effects of plyometric activity involved the upper body on arm and shoulder griddle power. For the purpose of this study 34 college males were given a test of upper body power(medicine ball throw). The subjects were randomly assigned to one of two work out groups. All subjects participated in strength training class which met 3 days a week and all of which followed same workout format i.e. The percentages of max and numberreps and sets being the same for all classes had roughly the same number of subjects assigned to each of the two groups. The subjects in group one performed their regular strength training workout after warming up with traditional style push-ups each class day. The subjects in group two began each day with a group of plyometric pushups followed by their normal workout. After initially determining the respective number of regular pushups and/or the number of plyometrics pushups each subject could perform, the subjects were asked to perform 90% of the number the first week. Each week thereafter, the subjects added 2 pushups to this number for each of their three times weekly workout. At the end of the 9 weeks of training, they were performing 16 additional pushups. The plyometric pushups consisted of a bounding style whereby the students exploded into the upward extension phase of the pushup to the point, their hands would
leave the surface. The subjects would then clap their hands together and land back on the surface. As the students were landing back on their hands they would go in to the forearm flexion phase of the push up without stopping and then would explode upwardly again. The subjects continued this programme for 9 weeks and were retested for upper body power with the best of five trials measured to the nearest inch. The following conclusions were drawn from the study: When comparing the effects of plyometric pushup training to regular push up training as to the effects on upper body power, it appears that the addition of the plyometric pushups to a regular strength training programme will significantly improve upper body power. It also appears that the use of plyometric pushups by shot putters and others might be of significant value to their performance in upper body activities.

Bobbert et al., (1987) investigated the influence of jumping technique on the biomechanics of drop jumping. To serve this purpose, 10 subjects performed drop jumps and counter movement jumps (CMJ) from a height of 20 cms. The drop jumps were performed using 2 different techniques. The first technique (Bounce drop jump) required the subjects to Reverse the download velocity in to an upward velocity as soon as possible after landing.

Lawrence (1988) conducted a study to find out the effect of bouncing run on triple jump performance. For this study 60 school boys were selected as subjects and experimental treatment hop and step exercise and bounding exercises were given to the experimental group subjects for a period of 6 weeks with three times in a week. He concluded the following from his study.

1. The explosive power gained as a result of bouncing run exercises significantly improved the performance of triple jump.
2. The hopping length was improved properly.
3. The striding step was improved properly.
4. The coordination of hop step and jump was improved
5. The rhythm between hop, step and jump was found improved.

In the past years scientists and coaches devoted much attention to perfection of specialized strength preparation of athletes. A special investigation by Yuriy (1973) showed that effective improvement of reaction ability of the nerve-muscle apparatus is achieved in the take-off only from a determined height. At the first height (2-5 % feet), maximum speed is achieved in stretching the muscle from yielding were to overcoming work, and the second height (3 - 7 % feet) corresponds to the maximally strength development. The number of jumps depends upon the qualifications and preparation of the athlete. The jumpers are executed in series (10 times from a height of 2-5 % feet and 10 times from height of 3-7 ~ feet). In contrast to strength exercises and frequent barbell exercises, the after effect in the depth jumps is maintained significantly for a longer period from 6 to 8 days. Because of this, depth jumps should be discontinued 10-14 days before competition.

The most sports specific movements the stretch shortening cycle (SSC) of muscle is a key element for powerful force production. The study by Blicher et al (1989) indicates that SSC is a relatively independent motor ability, and to confirm this hypothesis a longitudinal study with 9 subjects was designed. They performed depth jumps with specific heights in three sets with 20 repetitions each and a rest interval of a 5 minutes duration was allowed between the sets. The duration of training was 4 weeks with 4 workouts per week. Short jump (SJ) and depth jumps (DJ) were performed from a height of 32,48 and 56 ems, on to a force plate. The height of raise of center of gravity was calculated from the flight times. The results of the study showed a significant increase in height of raise of center of gravity of the DJ from all heights and a moderate increase in SJ. It is obvious that the jumping performances are primarily due to qualitative and quantitative modification effects of the nervous system. The authors concluded that SSCs can be regarded as relatively independent motor qualities because of this they must be trained separately.
Sahayaraj (1990) conducted a study to investigate the effect of depth jump and hurdle leap drills on leg explosive power. For this study 90 students, 12-15 years age were selected as subjects and divided them into 3 equal groups. Group one depth jump group, group two hurdle leap exercise group and group three control group. The two experimental groups were given their respective experimental treatments and the control group was not given any training for a period of 6 weeks with three times a week training. The following were his conclusions.

1. it was observed that there was significant improvement in the standing long jump in both the experimental groups due to depth jump and hurdle leap exercise trainings.

2. it was also found that depth jump and hurdle leap exercises had great effect on the beginners among high school boys.

3. Explosive power gained as a result of directed depth jump and hurdle leap exercises, significantly improved the performance in standing broad jump.

Avis et al., (1986) investigated the negative arid positive work performed during leg extension movements. 43 well trained subjects participated in this study. Each subject performed two types of "all out" leg extension at different loads: a squat movement (SM) from a starting position with 70 degree knee flexion and a leg extension when a preparatory counter movement from an initial.

Germar (1988) studied the effects of weight training plyometric training on vertical jump, standing long jump and 40 mts sprint. The training protocol consists of plyometric drill twice a week, weight training exercises three times a week for an eight week period. The results showed that the sideman gains from the pre-test to the post-test for the Weight training , plyometric training and control groups respectively were: standing long jump + 11.20 em,
9.5 cm and .5 em. Vertical jump = 2.3 cm, 1.78 em and .2 cm and 40 meters sprint = -.21 second, -.20 seconds and -.03 seconds. The gains achieved by both treatment groups were significantly (p less than .05) greater than those experienced by control group, but no significant difference existed between the gains attained by the two treatment groups. It is concluded that under the delimitations of this study there is no significant difference between the programmes in improving leg power.

Torrey (1985) in his study the subject was allowed to damp the gravitational pull longer with a greater change in the knee angle. From the results of the study, the researchers suggested that increase in the performance of the skeletal muscle through pre stretching, in the conditions of the present study, was sprint (which tests the ability and speed at which the players can change attributed to the combined effects of the utilization of stored elastic energy and the reflex protestation of muscle activation. At the University Maryland, a twelve week study was educated on football players to test the effectiveness of adding plyometric to conventional training with the addition of the plyometric drills to conventional training, the football players reduced an average of 30 seconds from their 1.5 mile run, 2 seconds from 30 yard cone sprint (which tests the ability and speed at which the players can change direction), and increased the maximum weight they lift in a parallel squat by 16 pounds.

Fibromyalgia (FMS) is a common chronic pain syndrome, poorly understood associated with a significant amount of muscle tenderness and often accompanied by fatigue, sleep disturbance and depressed mood. It is being increasingly shown that relaxation techniques are helpful in managing chronic pain, helping patients to change their inaccurate, self-defeating beliefs and regain a sense of control over their lives. This study by Silva et al., (2006) was, therefore, undertaken to verify whether strategies which combine stretching and relaxing techniques of Yoga may interfere with the improvement of pain and the impact of fibromyalgia in daily life. We also
aimed to assess if the addition of therapeutic touch would make any significant difference on the proposed strategies. 40 women fulfilling the ACR criteria for the classification of FMS were enrolled for this study, assigned for 2 different groups: the Relaxing Yoga group (RY) and the Relaxing Yoga added up with touch group (RYT). Both groups were submitted to 8 weekly sessions of stretching, breathing and relaxing yogic techniques and the RYT group was further submitted to manipulative techniques of sliding and pressuring over major body segments. Each session had a median duration of 50 minutes. One week before the first session, and 5(+1) weeks after the termination of the treatment, pain threshold at the 18 tender points with a dolorimeter, a verbal graduation of pain and the Fibromyalgia Impact Questionnaire (FIQ) were assessed. The visual analogue scale of pain (VAS) was assessed before and after each session and re-evaluated 5(+1) weeks after the last session. Seventeen patients from the RYT group and 16 from the RY group completed the treatment, and 7 gave up or were excluded. The result revealed that both RY and RYT groups presented significant improvement of the FIQ (p=0.009 and 0.007, respectively). There was no difference in the pain threshold parameters for any of the two groups. Both groups showed significant immediate decrease of AVS scores, with a slightly better improvement in the RYT group, with a significant difference in sessions 2 and 6 (p=0.0081 and 0.0334, respectively). Interestingly, while the RYT group presented lower VAS and verbal scores for pain on the 8th session (p=0.007 and 0.001, respectively), this difference was not maintained on the re-evaluation visit, 5(+1) weeks after the termination of the treatment. Conversely, on the RY group the scores obtained after the last session was not significantly different from the initial visit, however, the VAS and verbal scores were lower than the initial one, on the re-evaluation visit (p=0.020 and p=0.001, respectively), but not different for the RYT group (p=0.453 and 0.206, respectively). Thus, stretching and relaxing yogic techniques are valid instruments to relieve symptoms in FM, and the adding up of touch showed a better result during and immediately after the treatment. Over time, however, patients from the RY group reported less pain than patients from the RYT
group. Our preliminary results suggest that a closer and more intensive intervention of the therapist, as represented here by the touch techniques, may not bring further benefit. On the contrary, it might possibly increase patients’ passivity and dependency on the therapist decreasing their own sense of control over their symptoms.

Jarubula Ramu (2006) in this research paper explained the application of yoga in physical education and sports. All the systems of yoga namely Karma yoga, Bhakthi yoga, Jnana yoga, Hatha yoga, Mantra yoga, Tantra yoga, Laya yoga, Kundalini yoga are important for physical educationists and players. But the degree of importance may vary depending upon the nature of yoga. Karma yoga is useful for players to develop the steadiness of mind through selfless action. Application of Bhakthi yoga principles helps them to achieve better emotional stability. Jnana yoga provides knowledge, insight and wisdom which are essential to lead successful life. Hatha yoga helps to have better control over the body. Regular practice of Mantra yoga develops the coordinated action of body and mind of players. Tantra yoga develops concentration. Players can practice Laya and kundalini yoga at later age to lead a peaceful life. The physical, physiological, biochemical and other benefits of yoga for physical education and sports are of immense importance. Each player need not practice all the yoga. Although the specific requirement for the players differs based on the nature of game and their playing position depends upon the requirement, the players has to practice most suitable yoga to derive maximum benefit. The players, physical educators and coaches should have a through knowledge of eight limbs of yoga including asana. The physical educators and coaches should motivate the players to practice selected suitable yogic practices depending upon requirement in addition to regular training to coordinate the actions of body and mind.

A good beginning will have a good end. It is applicable to anything it may be a work or a game. Now a days, sportsmen are doing their task well.
Though, they have to concentrate in a necessary thing, that is yoga which will help them to develop their ability to get success in all games with a minimum stress and strain. In this paper, Kamalakannan (2006) highlighted the importance and influence of yoga in sports. Yoga plays role during pre-season, competitive season and transitional season stages of athletes. Further, Yoga keep them always in a balance state when they indulge in a game, and it makes his mind fresh and free to reach his goal. This brings success in a competitive game and even in making the players feel free mentally and physically after their hectic task also. In fact, Asanas, Pranayama, Kriyas (Kapalapathi and Thiradaga) etc. make sports person physically wealthy and mentally healthy to shoot his aim without obstacles. Thus, in the case of the professional sports person, the right approach is to use yoga.

Over the last one century, scientific application to sports training and performance has reached such phenomenal levels and brought out super human performances in the arena of sporting competitions. However this trend has slowed down over the last one decade as lesser number of world records registered at world and Olympic championships. The reasons for this state of affairs may be attributed to stagnation in ideas of scientific application of knowledge and also due to increased vigil of the International Olympic Committee in matters of doping and other malpractices adopted by both trainers and trainees. As a result of universal knowledge of training methodology and the interest evinced by the national governments and the private and commercial bodies, the athletes have reached the optimal physical, physiological, technical and tactical equanimity at highest level of performances. Sportspersons are to bring out best performances not only from their known levels of capabilities but also beyond such levels either to win or to create new records. This cannot happen unexpectedly. The athlete shall be prepared for such eventuality by preparing himself to such levels of performances during training itself. The psyche of the sportsperson shall pave way for such efforts by way of following a regime of mental training by
adopting such training methods such as Yoga, autosuggestion, mental practice, self hypnosis in the process. Of these, Yoga and yogic practices can alone stand to test of consistency when it comes to the cause and effect phenomenon. Rao (2006) suggested that clubbing yogic activities, with the game/sport specific training of a sportspersons, a sportsman can be benefited to the fullest extent.

A written questionnaire was completed by fifty men and twenty five women between the ages of twenty and sixty years describing their jogging programs, assessing their basic knowledge and use of exercise training principles, and comparing their actual frequency and duration of exercise to recommendations made by ACSM (Kimbrough 1984). Resting and typical jogging heart rate were measured to determine intensity of exercise based on maximum heart rate reserve for comparison with ACSM guidelines. Results demonstrated that 45% of subjects jogged 3-5 times per week with 84% jogging for thirty to 45 min at a M intensity of 79% of max heart rate reserve 75% did not monitor their exercise heart rate and 43% exercised for health reasons. 96% knew that aerobic exercise is best for fitness, 84% knew that the duration of exercise should be between 15 to 60 min and 73% knew that the frequency of exercise should be 3-5 days per week. 56% correctly indentified the recommended range of intensity. For intensity and duration of exercise 87% and 84% respectively, fell within recommended ASCM guidelines while 45% adhered to frequency recommendations. Most subjects trained within ACSM guidelines but did not check their exercise heart rate to monitor intensity.

Stumpo (1985) investigated the relationship between power and percent body fat and or power and anthropometric somatotypes in sixteen to eighteen year old male athletes. The subjects were sixty male student/athletes. The Margaria Kalamen power test and the heath carter anthropometric somatotype method were administered to determine power output and body classifications, respectively. Wilmore behnke regression
equations were used to statistically analyze the subjects to determine percent body fat. A pearson product moment correlation coefficient was calculated to determine causality at the 0.05 level of significance. The results of this investigation indicated that a significant relationship existed between power and percent body fat, power and endomorphy, power and mesomorphy, and power and ectomorphy.

48 boys and girls 10-11 years, classified as impulsive or reflective were randomly assigned to one of three modeling groups or a control group (Brown 1985). The modeling strategies included: silent model, verbal model and verbal model with self instruction. The task was a motor skill obstacle course in which both speed and errors were scored. Data were analyzed by a 2 x 4 MONVA with the number of trials to criterion, the average number of errors per trial, and the average amount of time on the three trials after criterion as the dependent variables. The results indicated that the REF children performed more accurately (took fewer trials to criterion and made fewer errors per trial) than did the IMP children. There were no difference in time scores. A cognitive x model type interaction revealed that IMP subjects made significantly more errors than REF children when performing without a model. Further, the IMP children performed equally as well after observing a silent or verbal model, or after observing a verbal model and participating in self instruction. The REF subjects performed equally as well after observing a silent or verbal model and slightly better with a verbal model plus self instruction. It was concluded that the modeling process is essential for IMP children and should be adjusted in an attempt to make the learning environment compatible with the learning of the child.

Effects of an eight week strength training program relative to isometric strength, isokinetic strength, anaerobic power and anaerobic capacity was examined (Alexander 1985). Male subjects (n=25) enrolled in a PA state university strength training class acted as the experimental group, whereas male subjects (n=13) who refrained from strength training served as the
control group. The training program included 13 Nautilus exercises executed three days per week over an eight week period. Physiological measurements were taken prior to and following training, ANOVA and t tests were used to test for significance. The experimental group experienced increases in isokinetic leg extension strength (60 degrees, 120 degrees and 180 degrees per second) while being significant difference from the control group. Anaerobic power (Margaria –Kalaman power test and Wingate Anaerobic test), anaerobic capacity (Wingate anaerobic test), and body weight did not increase significantly. The pre test correlations between isokinetic leg extension strength and anaerobic power (Wingate, r=0.24; Margaira Kalaman, r=0.22) and isokinetic strength and anaerobic capacity (r=0.23) were positive but not statistically significant. The results of this study reinforce that isokinetic strength, anaerobic power and anaerobic capacity are separate physiological potentials.

19 trained runners with a vo2 max of 68.2 ml/kg. min (58.0 – 76.0) performed a 7 min treadmill run at each of the following speed and grade conditions: 238 m/min, 0% grade; 167 m/min, 7.5% grade; 291 m/min, 5% grade (Breiner 1985). The three runs were all completed in one session and were separated from one another by a five min rest period. Maximum oxygen uptake was 46.8 (41.4 – 54.4) during level running, 48.0 (32.4 – 53.4) during uphill running, and 46.9 (41.5 -52.9) during downhill running. Subjects used an average of 69%, 71% and 69% of vo2 max, respectively, during level, uphill, and downhill running. Correlations in running economy using the Pearson product moment method were r=0.92, r=0.90, and r=0.83, respectively, between level vs uphill, level vs. downhill, and uphill vs downhill grades, indicating little variation in running economy over the three conditions. Spearman Rho rank correlations were r=0.92, r=0.84 and r=0.79, respectively. Volumes of expired air averaged 64.6, 64.8, and 68.1 L/min respectively, for level, uphill, and downhill running. Ventilator equivalents averaged 20.3, 19.8, and 21.3, respectively, for the three conditions. A one way ANOVA with repeated measures indicated that downhill VE was significantly higher than
both level VE and uphill VE (p<0.05) and that downhill VEQ was higher than both level and uphill VEQ<(p0.001). it is suggested that the higher ventilations observed during downhill running are a mechanical consequence of the higher impact forces during foot strike.

Subjects (11 male recreational basketball players) jumped barefoot on three landing surfaces: cast aluminum, tartan rubber, and midsole foam (Gross 1985). Subjects performed symmetric countermovement vertical jumps, touching a bar set at 90% of their max vertical jump reach. Three measurement techniques were utilized: collection of peak transient accelerations proximal and distal to the ankle with externally mounted accelerometers; collection of resultant vertical force with a piezoelectric force platform; and measurement of calcaneal and plantar/ dorsiflexion motions of the ankle with high speed cinematography. Data were examined across landing surface and landing style (heel contact landers (n=7), metatarsal only landers (n=4)). Landing surfaces did not produce stat significant difference in peak acceleration, vertical force, or joint kinematics. Peak calcaneal acceleration ranged between 25 and 70 g’s, while peak tibial acceleration ranged between 10 and 30 g’s. decreased range of tibial acceleration illustrated the ability of the body to damp transients as necessary. Metatarsal landers experience similar peak calcaneal accelerations as heel contact landers, but recorded 20% less peak tibial acceleration and max vertical force.

The purpose of this study was to determine the effects of eccentric work and its comparative contribution in the development of power and strength (Kennedy 1985). Three different strength training techniques were used and compared. Three groups of untrained subjects (males and females, n=33) were trained for ten weeks using one of the three prescribed methods. Pretest and posttest measures were taken for muscle girths, body fat, performance on Cybex at three different speeds of arm flexion and leg extension, and 1 RM strength tests using Nautilus machines. Results varied as to testing method used. When Nautilus was used as a testing modality, no
significant difference by group were found. However, males showed a significant greater response to eccentric only training as compared to concentric only and concentric eccentric. When a Cybex was used as a testing modality, using three different speeds (30, 60, and 120 per sec), the concentric only group performed significantly better than the eccentric only group or the concentric/eccentric group. For the females, no significant difference in response to training group were noted, however, the males performed significantly better than the females in the concentric only group.

This study was conducted in order to establish normal plantar pressure values for comparison to a pathological sample, and to construct predictive models of pressure data (Rogers 1985). A 1000 element piezoceramic pressure platform was used to collect plantar pressure data from 60 male subjects, 40 to 81 years of age. Three trials of data were collected from one foot of each subject during two conditions: first step onto the platform from a standing position; and mid gait step onto the platform. Physical measurements were incorporated in regression analyses. Results showed weight, arch index, and height to be the strongest predictor variables for regional plantar peak pressure and impulse of the variables used in this study. Regression equations for the arch, ball, and toe regional peak pressures and impulses provided limited prediction abilities. The regional peak pressures and impulse values provide a database of normal values for the first step condition and for the mid gait condition. Based on the 95% confidence limits, the upper limit of normal over all regions would be 519 kPa for peak pressure and 33% for impulse. Results suggest that inference from first step data to mid gait data is feasible using ratio relationships. Regional pressures taken from mid gait collection were an average of 1.1 times those taken in the first step conditions.

Subjects for this study were 13 male members of a collegiate basketball team. All subjects were administered the vertical jump and reach test 14 times over a three week period (Wenning 1985). Upon completion of
the testing period, the national weather service at Bradley International airport in Windsor, Connecticut provided the test administrator with hourly barometric pressure readings (in millimeters of mercury) for the test days. A test day was classified as a low pressure day when the barometric pressure level reading was below 760 mm Hg at the time of testing. A test day was classified as a high pressure day when the barometric pressure level reading was above 760 mm Hg at the time of testing. Vertical jump score data and atmospheric pressure data were analyzed using a 2 x 5 (ANOVA) with repeated measures on both factors (atmospheric conditions and testing sessions), no difference (p<0.05) were found in vertical jump scores at high and low atmospheric pressure levels. No difference (p<0.05) were found across the five testing days.

The subjects were 23 male and 3 female marathon runners, CA’s if 23 to 50, who were tested before and after the 1985 Hogeye marathon in Fayetteville, AR (Karaemer 1985). Tests for pulmonary function consisted of FVC and FEV1. Blood samples were analyzed for sodium, potassium, glucose, LDH, creatinine, CPK, triglycerides, cholesterol, hematocrit, hemoglobin, protein, white blood cell number, uric acid, carbon dioxide, and iron. All of the blood parameters increased significantly in concentration with the exceptions of glucose and carbon dioxide. After accounting for plasma volume loss, there were significant increases in blood serum LDH, creatine, CPK, white blood cell number, uric acid, and iron, and significant decreases in sodium and glucose. There was a significant decrease in FVC. No strong relationships were found between performance time and blood chemistry or pulmonary function.

Literature reviews of two seemingly unrelated factors, muscles damage and E-C coupling interference, are combined to present an original hypothesis of fatigue occurring during prolonged submaximal work at less than 50% Vo2 max. whereas ATP energy depletion, causing E-C coupling interference produces normal fatigue in anaerobic white muscle fiber, it is not appropriate
to red aerobic fiber (Buncher 1985). It is suggested that protein debris from damaged Z lines, normally occurring during eccentric muscular contractions, are hydraulically distributed throughout the muscle. The debris accumulates at the triad junction, mechanically and/or electrically interfering with stimuli conducted through the T tubules. This increasing E-C coupling disturbance results in decreasing crossbridge cycling (contraction), i.e. fatigue. It is further suggested that the fatigue functions as a safety mechanism to prevent continuous submaximal contractions to the point of critical muscle damage.

This study monitored various parameters during delayed muscle soreness (DMS) in order to quantify some of the symptoms and to determine if motor performance was impaired during DMS (Torgan 1985). Additionally, the ability of static stretch to mitigate DMS was examined. Volunteer subjects were 24 females (m=20.5 yrs) who were randomly assigned to 1 of 3 treatments: control, placebo (application of a spurious “superficial stimulation”), or stretch (10 min of intermittent static stretching). All subjects performed an eccentric exercise regimen to the non dominant hamstring muscle group. Measures of resting and submaximal EMG activity, postural tremor, range of motion, and perceived soreness, in addition to blood sampling for creatine kinase activity were taken prior to exercise, at 26 hrs post exercise immediately after the application of a treatment, and 2 hrs after the application. Treatments were administered at 27 hrs post exercise. Difference between baseline and 26 hrs post exercise were analyzed with a paired t test. Pearson r were calculated on these differences. Changes over trials throughout the course of the treatments were assessed with a repeated measures ANOVA, covarying on the baseline when appropriate. Results revealed no change in EMG activity; a highly significant increase in tremor amplitude (7.5mv) soreness and CK activity (53mU/ml), and decrease in ROM (30mm), 26 hrs after the exercise (p<0.01). as soreness increased, ROM decreased (r=-0.58, p<0.01). the treatment of static stretch was effective in restoring ROM (p<0.01) and caused a marked (although not statistically significant) decrease in perceived soreness. The placebo and control groups
had no effect on any of the parameters. It was concluded that the DMS incurred by the subjects in this study was the result of tissue damage (as evidenced by increased CK) as opposed to muscle spasm (as indicated by no change EMG). The increase in tremor amplitude indicated that motor performance during DMS could be impaired. Lastly, a static stretching regimen was found to be temporarily effective in restoring the decreased flexibility as well as alleviating some of the soreness.

The study investigated the relationship between running pace and time for the 5 km, 10 km, and 10 mi distances and the following variables: HR, Vo2 and treadmill speed at aerobic and anaerobic thresholds: VO (running economy) and HR at 3 submax standardized treadmill speeds (196, 215, 241 m/min); and max Vo2 (Fay 1984). Derived variables were relative Vo2 at the 3 submax treadmill speeds. 14 moderately to highly conditioned female runners between 18 and 33 participated as volunteers. A series of 10 min steady state treadmill runs were administered to determine AerT (venous lactate = 2.0 mM/L) AnT (venous lactate = 4.0 mM/L) and running economy. Max Vo2 was determined using the Astrand Rodahl protocol. Subjects performed the 5 km, 10 km and 10 mi time trials on an outdoor 5 km course under competitive conditions. Results showed running economy was not a consistently significant determinant of performance pace in homogeneous subsets of female runners. Stepwise multiple regression analyses were conducted with race pace as the dependent variable and 2 variable equation was developed for each race pace, with Rs exceeding 0.970. it was concluded that race paces can be predicted accurately from laboratory data for adult women.

To summarize, the benefits and superiority of various training interventions are presented in this chapter. Some of the references are also available on plyometric exercise and resisted jump training. Although there are some promising findings noted so far, the study on combination of yoga and plyometrics training is meager. Hence the present study seems to be justified.