CHAPTER – II

REVIEW OF RELATED LITERATURE
CHAPTER - II

REVIEW OF THE RELATED LITERATURE

A summary of the writings of recognized authorities and previous researchers provides evidence that the concerned researcher is familiar with what is already known and what is still unknown and untested. Since effective research is based upon past knowledge, this step helps to eliminate the duplication of what has been done, and provides useful hypotheses and helpful suggestions for significant investigation\(^1\).

Review suggests a method and a technique of dealing with a problematic situation, which may also suggest avenues of approach to the solution of similar difficulties, a scholar may be facing. It can provide the investigator with new ideas and approaches, which may not have occurred to him. It also assists the researcher in evaluating his own research efforts by comparing them with related efforts done by others\(^2\).

Keeping the previous references as guide-lines, efforts were made to find out the researches completed related to the present study by giving visit to the libraries of the following colleges viz. (1) Amravati


University, Amravati, (2) Degree College of Physical Education, Amravati and (3) Shree Shivaji College of Education, Amravati.

Vaidya\(^3\) carried a research project on hemoglobin percentage amongst the girls participants of VII Mini National School Games. The study was delimited to age below 14 years of age and was representing the state team in Basketball, Kho-Kho, Kabaddi, Volleyball and Table Tennis. The purpose was to examine the hemoglobin percentage. The blood hemoglobin level was found to be below normal amongst more than 80% of the girls who were representing the various states. Nearly 45% of girls from Gujarat and Rajasthan were found to be under stock and therefore immediate measure were found to be needed by the concerned state authorities.

Barritt\(^4\) undertook a comparative study of Physical Fitness in San Diego City schools in 1963. The California physical performance Sit-ups, standing broad jump, 50-yard dash and 12 softball throw for distance, was used to compare 1800 senior boys who had completed three years of physical education with 125 senior boys who had completed three years of


military science. The results reflected only the fitness when they were tested. The mean performance of the physical education students was significantly higher than those of the military science students.

Namiko⁵ undertook a study in order to compare the physical fitness of children in Iowa and Japan. The Iowa test of motor fitness was given to 395 Tokyo children and 355 Iowa children, 9 to 12 years of age. The Test Battery included sit-ups, standing broad jump, shuttle run, forward bend, grasshopper pull-ups for boys, bet arm hang for girls and dash. Anthropometric measurements were taken in height, weight, knee finger length and leg length. The results indicated that Iowa children were heavier, taller and had longer legs than Tokyo children but Tokyo children scored better in all motor performance tests except one, sit-ups. A comparison of the physical education programme in the schools was also made and showed that the Tokyo children had more chance for activity through physical education than Iowa group.

Rosentein⁶ and Frost compared the physical fitness of senior high school boys and girls participating in selected physical education programme


in New York State. The York Physical fitness test was administered in October and May to the pupils of 13 Senior high schools whose physical education programme were rated low by numbers of the Bureau of physical education and 16 high schools whose programmes were rated high. The 10 parts scorecard was utilized to validate these ratings. The amount of physical activity outside of class was recorded by each pupil and effect analysed pupils participating in good programme improved significant in poor programmes. The greatest improvement was in strength with some gain in agility, balance and endurance.

Kosydar\textsuperscript{7} compared the physical fitness of children attending two elementary schools in Portland. He administered the Organ Motor Fitness Test children of two schools at the beginning and end of twelve marks. The experimental group participated in a physical education programme and the control group had a traditional four-play period. Girls in the experimental school should improvement an every item crossed-arm-level-ups and made a significant gain in hanging in the arm-flexed position. Boys in the experimental group increased standing broad jump scores in push-ups despite decline scores in same grades. Comparison between level showed a

\textsuperscript{7}Ktoni J. Kosydar, “Comparison Of Physical Fitness Between Two Elementary Physical Education Programmes In The Portland, Oregon, Parochial System”, \textit{Completed Research In Health, Physical Education And Recreation}, 5 (1963), p. 86.
slight superiority of the experimental group benefited in physical fitness but lacked sufficient vigor.

Craig\textsuperscript{8} compared the physical fitness levels of Canadian and African school boys by employing AAHPER physical fitness battery (1961) the result showed that physical fitness level of South Africans high school boys were higher than those of Canadian high school boys.

Ramadan\textsuperscript{9}, conducted a study on "Selected Physiological, Psychological, And Anthropometric Characteristics Of The Kuwaiti World Cup Soccer Team" in 1984.

The purpose of the investigation was to examine the maximal oxygen consumption (VO\textsubscript{2} max), maximal anaerobic power (AP Max), body composition (BC), Somato type (ST), the Profile of Mood States (POMS) and the State- Trait Anxiety (STAI) characteristics of the Kuwaiti World Cup Soccer Team.


\textsuperscript{9}Ramadan, J. Mohammad, "Selected Physiological, Psychological, And Anthropometric Characteristics Of The Kuwaiti World Cup Soccer Team", Dissertation Abstract International, Vol. 46, No. 4, October, 1985, p. 924-A.
VO$_2$ max was determined using a progressive cycle ergometer protocol with data obtained by standard semi-open circuit spirometry. AP max was calculated by using the highest value of three vertical jumps applied to the Lewis formula: (49 x weight x D) BC was estimated by skin folds and ST was by the Heath-Carter method. Translated Versions of POMS and STAI were used.

The Kuwaiti team exhibited moderately high aerobic (51.9 ml/Kg min.$^{-1}$) and anaerobic (119.6 kg*m/sec) power, both values being significantly higher than college norms, but in the mid-ranges for world-class athletes in general. Relative body fatness (8.9%) and a balanced Mesomorphic Somato type (2.1-4.5-2.) were comparable to those of athletes in other high-level team sports. The World cup soccer players revealed a significantly higher value in the anger factor when evaluated by POMS. Contrasted to other findings on both elite athletes and college norms. This factor was determined to be normal on Follow-up testing 18 months after the World cup Games. Finally, they also showed higher state and trait anxiety than the college norms and when compared to other athletes.

Analysis by playing position revealed the goalkeepers to have higher AP max, per cent fat, mesomorphy, and both state and trait anxiety levels, along with lower Vo2 max, compared to players of other positions. Midfielders had the highest Vo2 max and were the leanest. Offensives exhibited the lowest tension, depression, anger, confusion, and trait anxiety levels. The defensives’ primary differentiating characteristic was a high AP max, comparable to that of the goalkeepers. The starters were significantly
older, less fat, and were higher in both state and trait anxiety than the substitutes.

The structural and functional measures taken for this study appeared to indicate that the Kuwaiti team had appropriate potential for World Cup competition. Excessively high state and trait anxiety, and anger indicates that more psychological preparation was needed.

Dianne\(^\text{10}\) conducted study on “The Developmental Relationship Between Perceived And Actual Competence In Motor Ability And The Relationship Of Each To Motivation To Participate In Sport And Physical Activity” in 1984.

Perceived competence has been theorized as having an important affect on one’s level of motivation (Griffin & Keogh, 1982; Harter 1981 a; Nicholls, 1978). Actual competence purportedly indirectly affects level of motivation by influencing one’s perceptions (Harter, 1981a; Bandura, 1977). Recently investigators have begun to examine the interrelationships among these variables within the motor domain, Critical years in the development of these interrelationships, however, have been virtually unexplored, (i.e. the childhood years). This investigation examined the developmental

relationship between perceived and actual competence in motor ability and the relationship of each of motivation to participate in sport and physical activity.

Twenty-five males and 25 females at each grade level. kindergarten through fourth, participated as subjects in this study. Perceived competence in motor ability was measured via two psychometric scales, the perceived Competence Scale for Children (Harter, 1979b) and the Pictorial Scale of Perceived competence and Social Acceptance for Young Children (Harter, Pick, Efron, Chao & Bierer, 1983). Actual motor ability was measured by performance on a nine-item motor abilities/sport skills assessment battery. Participation motivation was reflected by the child’s participation in organized sports.

Univariate and multivariate analyses suggested that for children in these grade levels, perception of competence in motor ability was not significantly related to participation in organized sports. Multivariate analysis indicated that actual ability was significantly related to participation in organized sports. Post hoc univariate F tests and discriminate function analysis indicated that the difference in favor of the participants was primarily due to performance on the sport skill items. Multivariate analysis and correlation procedures suggested a significant relationship between perceived competence and actual competence in the motor domain. Again, subjects’ scores on the sport skill items were most important in distinguishing among subjects with height, average, and low perceptions of their competence. None of the major relationships examined changed
Universities (Four from South-West Zone (SWZ) and Nine from North-East Zone (NEZ) of Indian were taken for the present study. Nine anthropometrical i.e. age, height, weight, ponderal index, arm length, palm length, thigh girth, calf girth and wrist diameter and eight physiological variables i.e. heart rate, vital capacity, breath holding time, peak flow rate aerobic power, anaerobic power, fat weight and lean body mass has been selected. Subjects were divided in four groups, first four, (N=48 Three terms from South Zone and one from North Zone) South, (N=36) North, (N=48) and Others (N=66). In first four groups those team players were included who secured first four positions in AIIZT. South group included those team players that represented AIIZT from SWZ or first three-position holder of Southwest zone. North group included the first four-position holder of NEZIUT. Others group included those team players that had participated in NEZ and SWZ Inter University Tournament and secured no position. To test the significant difference among the groups ANOVA was applied Level of significance was set at 0.05 level.

Singh and Malhotra\(^{13}\) carried out a study on “Heath-Carter Anthropometric And Photoscopic Somato types Of Selected Olympic Athletes” in 1990. Comparisons between the Anthropometric and Photoscopic Somato types of 26 Olympic athletes, based on Heath and carter method (Carter 1975), have been attempted in the present paper. The

objective is to quantify differences in somato types by the two methods in different types of athletes. The photoscopic ratings to the athletes have been assigned by the senior author (SPS). Since its assessment is based mainly on the distribution of somato types at a given ht/wt 0.33 ratios, and then subjectively choosing the three components from the range of somato types given, there would be chances of individual biasness. In order to minimise this bias, the somato types were assessed at two different times independently. Complete somato types were assessed at two different times independently. Complete agreement in the two assessments for individual components in the sample was observed in 79.49%, a difference of 0.5 unit in 12.82% and a difference of 1 unit in 7.69% of the cases. The final photoscopic somato types of the cases, in which there was a difference in the assessment on two occasions, were reassigned. The mean anthropometric and photoscopic somato types of the present sample were 1.79 - 4.85 - 2.75 and 1.96 - 5.73 - 259 respectively. Complete agreement in the two methods has been found in respectively. Complete agreement in the two methods has been found in 26.92% in the case of endomorphy, 19.23% in mesomorphy and 61.54% in ectomorphy. Further analysis indicated that difference between the two somato type methods were minimum in ectomorphy and the greater in mesomorphy. The means of endomorphy and ectomorphy by the two methods were statistically non-significant, whereas mean value of mesomorphy with the photoscopic method was significantly higher than with the anthropometric method.
Kansal et al.\textsuperscript{14} carried out a research project on "A Kinanthropometric Study of University Volleyball and Football Players" in 1987. Anthropometric measurements were taken on twenty-three football and fifteen volleyball players who attended an Inter-University coaching camp held at Punjabi University, Patiala, in October 1985 with a view to studying their physique and body morphology. Also studies were on hundred control subjects. Different anthropometric variables including linear, circumferential and skinfold measurement were taken. Body physique was calculated from skinfolds using Health\& Carter method (1967), and body fat was computed from skinfolds using Durnin \& Womersley (1974) equations. It is found that the footballers are of average height, however, the volley-ballers are taller than their control counterparts. The footballers have larger trunks and smaller lower extremities than the volleyballers who do not differ much from the controls in this relationship. The volleyballers and footballers have linear physique and larger limb girths but less body fat than controls indicating their relatively more muscularity. The anthropometric somato types of volleyballers and footballers are 2. 16-3, 23.3, 97 and 1.87-3.44.3-59 respectively indicating less endomorphic component than controls. Compared to the Olympic level players, the players of the present study are lighter and shorter. The present findings suggest that there is an urgent need

to produce baseline anthropometric data for various body size, shape and compositional measures of different categories of players.

Sihi and Bandyopadhyay\textsuperscript{15} conducted a research on "The Role of Some Selected Anthropometric Variables in Explosive Strength of male Volleyball Players" in 1989. The study has been aimed to identify the relationships between selected anthropometry and explosive strength and comparison of the same variables between District and Sub-Division level volleyball players. Forty-six district and Sub-Division volleyball players having mean age of 22 years were randomly selected from four clubs of three Districts of West Bengal.

Among the anthropometric measurements- lower limb length, upper limb length, and circumferences of chest, thigh, calf and bicep were measured. Leg and arm explosive strength were measured by vertical jump and medicine ball throw test respectively.

After analysing the data it was found that the District players were superior to sub-Divisional players in explosive strength. The limb length may be considered as one of the determining factors of explosive strength.

Sharma and Pal\textsuperscript{16} completed a research project on “Comparison of Selected Anthropometric Measurement And motor fitness of Mongolian and Non-Mongolians” in 1989. In Asia leasing countries in sports are China, Japan and Korea and in fact their citizens are Mongolians by race, In India we are having people of various races. Thus the researcher has made an attempt in this direction, that how far the Mongolians differ to other races in terms of their Anthropometric measurements and in Motor fitness which are essential of any top level performance in games and sports.

Forty male students 18 to 24 years of age who were enrolled in professional courses of physical education at Lakshmibai National College of Physical Education, Gwalior and Bachelor of Engineering at the Madhav Institute of Technology and Science, Gwalior were selected by random method as the subjects of this study. Mongolians were kept in one group while Non-Mongolians were assigned to the other group.

The criterion measures chosen for this study were numerical scores obtained from selected anthropometric measurements and the performance of the subjects in various components of motor fitness. The anthropometric measurements selected for this study were upper arm girth, chest girth, bi-ilanc diameter, thigh girth, calf girth, height and weight. Various components of motor fitness those chosen were agility, speed,

power, reaction time, endurance and balance. Tests used for these variables were 4x10 yard shuttle run, 50 yard dash, standing vertical jump, reaction time (Anand’s Electronic Instrument Test), 12 minutes run/walk and modified Bass test respectively. The scores of various components of motor fitness were converted into standard scores with the help of t scales and the composite scores of these represented the motor fitness of the subjects. The tests were repeated on two days in order to establish the reliability of data. The data were subject to the ‘t’ test to check the significant differences on selected anthropometric measurements and the components of motor fitness.

The analysis of data revealed that Mongolians and Non-Mongolians did not differ much on selected anthropometric measurements and various components of motor fitness; however, significant differences in height and power were found. The comparison of composite scores of motor fitness components also did not reveal significant difference between Mongolians and Non-Mongolians. They concluded that (1) the height of the subjects was significantly different. The Non-Mongolians were taller than Mongolians; (2) Non-Mongolians possess more power than Mongolians; (3) Mongolians and Non-Mongolians did not differ significantly in variables other than height and power; and (4) the motor fitness of Mongolians did not prove to be superior than that of Non-Mongolians.
Barik and Banerjee\textsuperscript{17}, conducted a research on "Effect Of 6 Weeks’ Conditioning Programme On Some Selected Anthropometrical Variables Among Tribal And Nontribal Boys" in 1993.

Anthropometry or morphology refers to the shape, size and the form of an individual, which are manifestation of the internal structure and tissue component, and which, in turn, are influenced by the environmental and genetical factors.

The main purpose of the study was to compare the anthropometrical characteristics of Santal (Tr, N=17) and Nonsantal (NTr, N=21) boy students and also to find the variations in these characteristics if any, following 6 week’s training. The variables measured were girth circumferences of biceps, chest, abdomen, hip, thigh, calf, neck, and the shoulder to shoulder distance. All the measurements were taken twice, before and after the training.

Both before and after the training in all the anthropometrical variables, the Tribal group had significantly higher values than the Nontribal group. But the sum total difference of these variables was not

\textsuperscript{17} Barik And Banerjee, "Effect Of 6 Weeks Conditioning Programme On Some Selected Anthropometrical Variables Among Tribal And Non-Tribal Boys", \textit{Research Bi-Annual For Movement}, Vol. 9, No. 2, 1993, p. 60.
significant between the groups. Though training had influenced most of the variables, but the sum total changes were not significant for both the groups.

William and Dorsey\textsuperscript{18} conducted a study on "Body Image Phenomena And Measures Of Physiological Performance" in 1967. This study was designed to investigate the relationships between three measures of body image and two measures of physiological performance. The fisher-Cleveland Barrier Index, the Second homonym Test, and the Body Cathexis questionnaire were correlated with dominant handgrip strength and the Michael-Gallon revision of the Harvard Step Test. Pearsons 'r' was employed to determine the degree of relationship. Fifty males selected at random from general education classes at San Fernando Valley State College Constituted the research sample. Of the six possible pairings only one reached statistical significance the homonym Test and grip strength ($r=33$ at .05 level). It was concluded that a general relationship does not seem to exist between the measures of body image and physiological performance utilized in this study. These and other findings led the authors to re-examine several questions concerning the nature of body image phenomena.

The Existence of body image phenomena appears to be adequately validated (1,5,6,12). However, the relationship of the body image to other dimensions of human behavior does not appear to have been clearly

established. This study was designed to investigate the relationships between three measures of body image and two aspects of physiological performance (muscular strength and cardiovascular endurance). It was predicted that, in general, the body image measures would be significantly related to the physiological variables and that those measures, which are most objective in their scoring technique, would demonstrate higher relationships to the physiological variables than would the more abstract body image tests.

Fifty males selected at random from general education classes at San Fernando Valley State College constituted the research sample. Pearson's $r$ was employed as the means of estimating the degree of relationship. The body image criterion tests were administered in the following order: (a) Barries Index, (b) Homonym Test and (c) Body Cathexis Questionnaire. Following the administration of these instruments the subjects were exposed to the muscular strength and cardiovascular endurance criterion tests. Extensive efforts were made to insure the standardization of the criterion tests. The test instructions and test contents were presented by means of tape recording. A controlled group Rorschach approach (24 response protocol) was employed in collecting the Barrier Index Data. The instruments involved in the collection of the physiological data were calibrated periodically. It was found that the Barrier Index was not significantly related to either of the performance measures. The Homonym Test was significantly related. (.05 level) to strength criterion ($r=-.33$). However contrary to the prediction the Body Cathexix mean score was not significantly related to either of the performance measures, nor were the specific "energy level" and "strength" items of the questionnaire related to
the corresponding physiological measures. Although not directly concerned with the stated purpose of the present study, the lack of inter-correlation between the three body image measures is of theoretical interest. Possible meanings were considered in the discussion below.

Carl W. Landiss\(^ {19} \) conducted a study on "Influences Of Physical Education Activities On Motor Ability And Physical Fitness Of Male Freshmen" in 1954. This article presents and analysis of the effects of eight physical education activities on physical fitness and motor ability scores of male college freshmen. The mean gain was computed for each group on both tests and individual test items. The mean gain of each group was compared with each of the other groups and significance of differences determined. The results seemed to indicate that of the activities studied tumbling gymnastics and conditioning best developed those abilities measured by the physical fitness test; while tumbling gymnastics and wrestling best seemed to develop those abilities measured by the motor ability test.

Among the recognized objectives of physical education are the objectives of developing physical fitness or motor fitness and motor ability. While considerable research has been done to establish tests to measure these abilities, relatively little experimental data are available concerning the contribution of a given activity to a specific objective. The value of an

investigation of this type lies in the light it may shed on which activities best
develop certain desired objectives within the participant. The objectives
considered in this study are limited to physical or motor fitness and motor
ability as measured by the tests selected. The relative value of developing
skills in certain activities, e.g., ability to swim, over-increasing physical
fitness or motor ability was not considered in this research.

Suryanovas and Parizkova\(^{20}\) compared the function circulatory
and respiratory capacities in girl gymnasts and swimmers. The investigators
were interested to know whether different demands of the two sports would
be manifested on the circulatory and respiratory capacities in women. The
groups of gymnasts and swimmers included 10 members from each. The
maximum minute ventilation correlated for conditions of BTPS in the
Swimmers was significantly higher. The difference disappeared, however,
when the values were calculated per Kg. of body weight. The utilisation of
oxygen from the ventilated air assessed during maximum performance was
higher in the swimmers than in the gymnasts. Comparison of the maximum
oxygen consumption calculated per Kg. of lean body mass in both groups
revealed that this indicator was significantly higher in the group of
swimmers than in gymnasts.

\(^{20}\)S. Sprynarova And J. Parizkova, “Comparison Of The Function Of
Circulatory And Respiratory Capacity In Girl Gymnasts And Swimmers,”
In the study of J.R. Morrow et. al.,\textsuperscript{21} anthropometric, strength and performance data were evaluated for forty-nine American discuss, Hammer, Javelin throwers, and Shot putters who participated in a Pre-Olympic training camp. Comparisons between event participants indicated that they differed significantly on the anthropometric and strength variables but were alike in terms of motor performance variables. Correlation analysis revealed that upper body strength correlated $r = .60$ with performance for discuss throwers, fat weight correlated $r = .08$ with hammer performance, and leg strength correlated $r = .72$ with shot put performance. For the javelin throwers, none of the anthropometric, strength, or motor performance variables was significantly related to event performance.

The purpose of the Ramadan\textsuperscript{22} investigation was to examine the maximal oxygen consumption (\(\text{Vo}_2\text{ Max}\)), maximal anaerobic power (AP max), both composition (BC), Somatotype (ST), the profile of Mood states (POMS) and the state-trait Anxiety (STA) characteristics of the Kuwait World Cup Soccer Team.


\textsuperscript{22}Jasem Mohammad Ramadan, “Selected Physiological, Psychological, And Anthropometric Characteristics Of The Kuwaiti World Cup Soccer Team,” \textit{Dissertation Abstracts International}, 46 (October 1985): p. 924-A
The Kuwaiti team exhibited moderately high aerobic (51.9 Ml/Kg. min\(^{-1}\)) and anaerobic (119.6 kg. m./sec.) power, both values being significantly higher than college norms, but in the mid ranges for world class athletes in general. Relative body fitness (8.9%) and a balanced mesomorphic somatotype (2.1-4.5-2.1) were comparable to those of athletes in other high-level team sports. The world cup soccer players revealed a significantly higher value in the anger factor when evaluated by POMS, contrasted with other findings on both elite athletes and college norms. This factor was determined on follow-up testing 18 months after the world cup game. Finally they also showed higher state and trait anxiety than the college norms and when compared to other athletes.

In Tegerse\(^{23}\) studied the French short serve and clear test and the Miller Wall Volley test were given to 23 Sophomore College for Women who had just completed a semester of Badminton. Motor ability was measured with the Scott test, Palmar and Dorsel Flexion Strength with a Tensiometer, temporal vision with a perimeter, and depth perception with the Howard-Dolman apparatus. Total badminton playing ability correlated significantly with general motor ability, depth perception and peripheral vision but not in total wrist strength.

Dey\textsuperscript{24} conducted a study with purpose to find out whether at certain levels of achievement, sportsmen participating in different games are characterised by distinct muscular strength, and to find out proportionate ratio of segmental and total body strength required for sportsman for particular sports. For these 12 players from each sport viz. Swimming, basketball, handball and table tennis were selected. The ‘F’ ratio obtained by one-way analysis of variance was tested for significance at .05 level. The study reveals that; (a) Basketball players were found more in leg strength, (b) Handball players have more grip strength, (c) Swimmers possess more one arm curl strength, shoulder, and abdominal strength, and (a) Table-tennis players are found comparatively weak in their muscular strength.

Griffin\textsuperscript{25} made a study of the heart rates of female in field hockey and basketball. It was concluded that the playing of field hockey was more demanding in terms of heart rates of the subjects participating than in the playing of basketball.


\textsuperscript{25}Norms S. Griffin, “A Comparison Of The Heart Rate Of Female College Participants In Field Hockey And Basketball”, Completed Research In Health, Physical Education And Recreation, 10 (1968):79.
Wither\textsuperscript{26} compared the aerobic power, anaerobic power and body composition of South Australian male representatives in athletics, basketball, field hockey and soccer, The runners and walkers exhibited the highest mean VO$_2$ max. There was virtually no difference between hockey and the soccer players. Basketball players registered the lowest mean. The team game players scored much higher than runners and walkers on absolute power. The scores of hockey and soccer players were almost identical as were the lowest scores of runners and walkers. The average percentage of body fat for the runners and the walkers, basketball players, hockey players, and soccer players were 13.1, 16.6, 16.7 and 15.7 respectively.

Hagerman et al.\textsuperscript{27} conducted a study of compare selected physiological variables among outstanding competitive oarsmen. Twenty six competitive oarsmen performed three different posts: static strength, rowing ergo meter, and a treadmill steady state run, to determine relative contribution of certain physiological variables to rowing performance. Static strength was measured by a cable tensiometer arrangement. Work output and heart rate were evaluated during exercise on a friction type rowing


ergometer, and dynamic respiratory function and heart rate were measured for normoxic and acute hypoxic conditions during a vigorous steady state treadmill run. Test results of those oarsmen achieving Olympic team status were calculated and compared with the Non-Olympic group by multivariate analysis of variance. The Olympic group was markedly superior in ergometer work output had a significantly lower energy cost, and demonstrated a greater respiratory adaptability to heavy exercise regardless of the inspired gas mixture. There were no significant differences in strength.

Fleck\textsuperscript{28} conducted a study to determine body composition of elite American Athletes. Five hundred twenty eight male athletes participating in 26 Olympic events and 298 female athletes participating in 15 Olympic events underwent determination of body fat percentage (% fat) and lean body mass (L BM), via hydrostatic weighing and/or anthropometric methods. All groups of athletes were below the average values for % fat of college age men and women of 15% and 25% respectively. In general, athletes involved in a sport where their body weight is supported, such as Canoe and Kayak (males 13.0 \( \pm \) 3.5%; females 19.5 \( \pm \) 2.8%), tended to have higher % fat values. Athletes involved in sports where a weight class has to be made to compete, such as boxing (males, 6.9 \( \pm \) 1.6%) and wrestling (male, Junior World Freestyle 7.9 \( \pm \) 2.7%), events such as the 100, 200, and

400 meters in athletes (male 100 and 200 meters, 6.5 ± 1.3%; female 100, 200, and 400 meters, 13.7 ± 3.6%) that are very anaerobic in nature and extremely aerobic events such as the marathon (Males, 6.4 ± 1.3%) demonstrated lower % fat values. Athletes involved in sports where body size is a definite advantage, such as basketball (males 84.1 ± 6.2Kg.; females, 55.3 ± 4.9 Kg) and volleyball (males, 75.0 ± 6.6 Kg.; females, 58.4 ± 4.5 Kg.) tended to have larger L. BM.

Basworth\textsuperscript{29} studied 187 college women who were tested for lift strength wan vertical jumping ability; anthropometric measure and ratios were ascertained from photographs. Correlations were computed between one vertical jump and each of the anthropometric variables and by strength. A multiple \textit{r} of 6.12 was obtained with the criterion using leg lift weight x shape index, bi-iliac, width/leg length 2, lower by length-1, lower trunk length 2, upper leg length 2, and foot width. Neither anthropometric measurements as strength variables, not the cumulative effect of the selected variables were sufficiently related to the vertical jump to predict performance adequately.

\textsuperscript{29}J.M. Baseworth, "Relationship Between The Vertical Jump Performance Of College Women And Selected Anthropometric Measurements And Strength Variables", Completed Research In Health, Physical Education And Recreation, 17 (1965): 93.
Atkinson\textsuperscript{30} investigated predicting performance in tennis, badminton and handball players from certain physical traits. Regression equations, using physical traits and class commitment as predictors, were developed for determining potential skill in beginning tennis, badminton and handball for college men. The physical traits used were: agility, power, hand-eye coordination and visual acuity. Skill level was determined by a round robin tournament in each sport. Subjects were 140 college men enrolled in beginning classes for each sport and taught by the whole part method. Control subjects included 138 students enrolled in other beginning classes and taught by the part method. Another purpose of the study was to determine if practice in the sport would significantly improve scores on the physical traits. A ‘t’ ratio was used to compare experimental and control groups. Conclusions were: class commitment is probably an integral part of skill attainment in the sports studied. Students who were taught tennis and badminton by the whole part method experienced greater gains in shoulder girdle power.

Davis\textsuperscript{31} conducted a study of relationship of reaction time, movement time and visual tracking to performance in badminton. He used a reaction time movement device, pursuit motor and the Miller Badminton wall volley test to collect data on 32 college women enrolled in badminton classes at Smith college and found that reaction time, movement time and visual tracking had no apparent relationship to performance in badminton.

In their study relating to maximal oxygen consumption, body composition and anthropometry on selected Olympic male athletes Woodward and associates\textsuperscript{32} observed that the tallest rowers and water polo players had significantly larger skeletal width and length measurements. The skinfold measurement showed larger fat folds on the trunk and extremities in water-polo players compared to the other three groups. Leanness of the upper extremity was significantly larger in rowers and water polo players, while that of the lower extremities was significantly larger in rowers only. Total body fat in absolute values was found significantly higher in water-

\textsuperscript{31}Partial Davis, “A Study Of Relationship Of Reaction Time, Movement Time And Visual Tracking To Performance In Badminton”, Completed Research In Health, Physical Education And Recreation, 10 (1963): p. 95.

polo players. Percentage wise there was no significant difference between the groups even through the water-polo players had the highest percentage of body fat.

Shondell\textsuperscript{33} established the relationship of selected motor performance and anthropometric traits to successful volleyball players. He used a six-item battery for this purpose. He found out that power appeared to be the most significant factor in successful volleyball performance.

Toriata\textsuperscript{34} et. al. studied the body composition and anthropometric characteristics of elite male basketball and volleyball players. This study comparatively assessed the body composition and anthropometric characteristics of elite basketball (N=15) and volleyball (N=15) players and male non-athlete (N=15) at the University of Nigeria. The ages of the subjects ranged from 19 to 25 years. Analysis of variance and Newman-Kewla posthor method was used to determine significant differences in the physical characteristics of the groups. The basketball players were significantly taller and had markedly larger humerous width than the volleyballers and non-athletic groups. The non-athletes had significantly


higher body fat percentage valves than both the groups of athletes (P=0.05). The basketball (4.30) and volleyball (4.40) players who were predominently ectoesomorphs, had significantly higher ectomorphic component (P=0.05) than the non-athletes (2.25). The morphological factors which influence the basic components of competitive sports performance.

Sprynarovas and Parizkova\textsuperscript{35} compared the functional circulatory and respiratory capacities in girl gymnasts and swimmers in 1969. The groups of gymnasts and swimmers included 10 members from each. The maximum minute ventilation correlated for conditions of BTPS in the swimmers was significantly higher. The difference disappeared, however, when the values were calculated per Kg of body weight. The utilization of oxygen from the ventilated air assessed during maximum performance was higher in the swimmers than in gymnasts. Comparison of the maximum of the oxygen consumption calculated per Kg of lean body mass in both groups revealed that this indicator was significantly higher in the groups of swimmers than in gymnasts.

Nemour\textsuperscript{36} in a study of relationship of Anthropometric measurement to performance in standing broad jump, medicine ball put and zig-zag run, concluded that though Negro boys and girls had longer appendages and were taller than Caucasians, they were not superior in the event of power and agility.

In his study of comparison of relationship between cardiovascular fitness and selected anthropometric measurement in eight grade boys mass and body surface area did not significantly limit performance in Ohio State University Step Test. However, Body Composition representing body fat limited the performance of college men only.

Chowdhary\textsuperscript{37} has conducted a study; comparison of selected physiological variables of Kho-Kho and Kabaddi Girls Teams of Tripura State. The purpose of the study was to compare the Tripura state Kho-Kho and Kabaddi girls Players in selected physiological variables. Fifteen Kho-Kho girls' players and fifteen Kabaddi girl players were selected for this study. All the subjects were tested in selected physiological variables, i.e. resting pulse rate, blood pressure, hemoglobin, content, vital capacity, breathe holding capacity, physical fitness and recovery period. Applying ‘t’


\textsuperscript{37}Seba Chowdhury, "Comparison Of Selected Physiological Variables Of Kho-Kho And Kabaddi Girls Team Of Tripura State. (Unpublished Master’s Thesis, Jiwaji University, 1980).
test to determine the significance of difference between the two means tested all the variables. The level of significance was chosen at 0.05 level of confidence. It was found that Kho-Kho is superior to Kabaddi as a form of training or game to develop significantly more vital capacity and recovery time. But no significant difference among the group incases of pulse rate, systolic and diastolic blood pressure, Hemoglobin content, breathe holding capacity and physical fitness index.

Browning\(^{38}\) made a comparison of sprint and distance runners on selected anatomical and physiological parameters sixteen volunteers of the 1963 Florida state university track squad were divided into two groups sprint group 100 to 440 yards men distance group 880 yards to two-mile men. Subjects were tested on 40 parameters. The sprint group had significantly larger means than the distance group on weight, heart rate recovery \(1/2\) t0time following the

Sprint work bout, resting diastolic, preceding maximal work bout, maximal recovery systolic blood pressure following the endurance work bout and minimal recovery diastolic blood pressure following the endurance work bout. The distance men had a larger mean performance time of the endurance work. Bout. Significant Correlations were obtained between the

Coaches rank and the event rank, total work performed during the endurance work bout and the cache’s rank, total work performed during the endurance work bout, and the event rank, hand response time preferred foot response time, and total extensor strength and total flexor strength.

Griffin\textsuperscript{39} Made a study of the heart of female in field hockey and basketball. It was concluded that the playing of field hockey was more demanding in terms of heart rates of the subjects participating than in the playing of basketball.

Gajendra\textsuperscript{40} Conducted a research Programme on comparison of selected physiological and physical fitness factors of soccer and cricket players in the year 1984. Of the study was to compare selected physiological and physical fitness components of soccer and cricket players. This study was conducted on fifteen cricket players in this age group of 22.4\textpm2.82 years. He concluded that soccer seems to have potential to develop cardio-pulmonary fitness, muscular endurance and explosive leg power more than cricket.

\textsuperscript{39}Norms S. Griffin, “A Comparison Of The Heart Rate Of Female College Participants In Field Hockey And Basketball”. \textit{Completed Research In Health, Physical Education And Research}, 10 (Jan 1968): 79.

\textsuperscript{40}Gajendra Prakash “Comparison Of Selected Physiological And Physical Fitness Factors Of Soccer And Cricket Players”. (Unpublished Masters Thesis, Jiwaji University 1984).
Mathur studied morphological and physiological differences among Nigerian hockey players in relation to their field positions. Here the investigation was carried out to examine certain morphological and physiological characteristics of 40 top-seeded Nigerian hockey players according to their respective playing position. The subjects were goalkeepers (N-5) back (N-12) halves (N-10) and forwards (N-13). Halves and backs were significantly taller (175 and 175.5) cm respectively) and forwards shorter (170 c.m.). Insignificant difference in trunk length, leg length, ponderal and leg torso indices were noted among the players of different positions. Percent body fat was significantly lower in forwards and higher in goal Keeper (9.6%) Significantly higher values of lean body mass were noted among back and forwards when compared to halves and goalkeepers. Mean Predicted V02 max value was significantly higher in forwards (59.3 ml kg./min) sa compared to players of other positions (helves, 55.9. back 55.3 and goal keepers 49.4 ml/kg/min). Explosive strength and static strength, as tested by vertical jumps and grip strength tests, were significantly higher in goalkeepers as compared to others. It was concluded that morphological characteristics of Nigerian hockey players of different playing positions are inconsistent to their requirements and there is enough scope to improve the aerobic capacity of the players.

Muthukalani\textsuperscript{42} compared the vital capacity of district level women Kabaddi players and women basketball players. It was observed that the Kabaddi player had better vital capacity than basketball players.

Deb\textsuperscript{43} studied with the purpose, to find out the differences in circulatory variables (Resting pulse rate systolic and diastolic blood pressure, Hemoglobin content'), respiratory variables (vital capacity and Anthropometric relative variables (ponderal and crural index) among the three participants of them sports, namely, Football, Volleyball and Hockey Players. The collected data were statistically analysed with the help of ‘F’ test. On the basic of analysis it was concluded that (a) the hemoglobin content in blood was more in football and hockey players than volleyball players. Also the vital capacity was higher in the case of football and hockey players than volleyball players: (b) there was no significant difference between the means of other physiological parameters, namely, systolic and diastolic blood pressure, resting pulse rate and relative Anthropometric measurements for the three groups, namely, football, volleyball and hockey groups.

\textsuperscript{42}Muthukalyani, "Comparative Study Of The Vital Capacity Of Women Kabaddi Players And Women Baldetball Players", (Unpublished Master’s Thesis, Madurai, Kamaraj University, 1986.)

\textsuperscript{43}Biplab Kumar Deb, "Comparison Of Selected Circulatory, Respiratory And Anthropometric Variables Of Students Participation In Different Team Sports" (Unpublished Master’s Thesis, Jiwaji University, 1984.)
Jonh and Peter\textsuperscript{44} have studied the anatomical and physiological differences between sprint and middle distance swimmers at the university level. The purpose of the study was to determine anatomical and physiological differences between sprint and middle distance swimmers at the forty-eight university swimmers, range in age from eighteen to twenty four years. The finding in this study was that the vital capacity of the middle distance swimmers is greater than that of the sprint swimmers. The brachial pulse wave was significantly greater than sprinter and it was concluded that the sprint swimmers have higher systolic blood pressure than the middle distance swimmers.

Sprynarovas and Parizkova\textsuperscript{45} compared the functional circulatory and respiratory capacities in girl gymnasts and swimmers in 1969. The investigators were interested to know whether different demands of the two sports would be manifested on the circulatory and respiratory capacities in women. The groups of Gymnasts and Swimmers included 10 members from each the maximum minute ventilation correlated for conditions of BTPS in the Swimmers were significantly higher. The difference disappeared, however, when the values were calculated per Kg. of body weight. The

\textsuperscript{44}John Blomfield And Peter O. Sigemeth, "Anatomical And Physiological Differences Between Sprint And Middle Distance Swimmers At The University Level" The Journal Of Sports Medicine And Physical Fitness, 5 (June 1965): 76

utilization of oxygen from the ventilated air assessed during Maximum Performance was higher in the swimmers than in the Gymnasts. Comparison of the maximum of the oxygen consumption calculated per kg. Of lean body mass in both groups revealed that this indicator was significantly higher in the group of Swimmers than in Gymnasts.

Mall\textsuperscript{46} conducted a study to compare selected respiratory functions-inspiratory capacity, expiratory Reserve Volume, vital capacity, one second Forced Expiratory Volume and maximum breathing capacity – on 32 students practicing yogic physical culture and Gymnastics, in the 12-16 years age group. The group means in the five respiratory.

Toriota\textsuperscript{47} et.al. studied the body composition and Anthropometric characteristic of elite male basketball and volleyball players. This study comparatively assessed the body composition and Anthropometric characteristics of elite basketball (N-15) and volleyball (N-15) players, and male non-athletes (N-20) at the university of If, Nigeria. The ages of the subjects ranged from 19 to 29 years. Analysis of variance and Newman-Keula posthoc method were used to determine significant differences in the physical characteristic so the groups. The basketball players were

\begin{quote}
\textquotedblleft Thankamma Mall, \textit{"A Comparative Study Of Some Pulmonary Capacities Of Boys Specializing In Gymnastics And Yogic Physical Culture"}, (Unpublished Master’s Thesis, Jiwaji University, Gwalior, 1975).
\end{quote}

\begin{quote}
\end{quote}
significantly taller and had markedly larger hummers width than the volleyball and non-athletic groups (0.05). The non-athletes had significantly higher present body fat values than both the groups of athletes (p 0.05). The non-athletes had significantly higher percent body fat values than both the groups of athletes (P 0.05). The Basketball (4.30) and volleyball (4.40) Players, who were predominantly ecto-mesomorphs, had significantly higher isomorphic component (P.0.05) than the non-athletes (2.25). The differences observed between the athletic groups are related to the morphological factors, which influence the basic components of competitive sports performance.

Bhowmik⁴⁸ Studied the comparison of selected parameters between soccer and Kabaddi players and found that the group mean difference was statistically significant at five percent level of confidence in favour of Kabaddi group in case of vital capacity and also at five percent level of confidence in favour of soccer group in case of resting pulse rate. It seems both the physiological parameters are significant. In the other way at five percent level of confidence in favour of soccer and Kabaddi group, systolic blood pressure and diastolic blood pressure, were nearly same and statistically non-significant.

Kalpana\textsuperscript{49} Compared certain physiological and physical variables of gymnasts and football players. The subjects were sixteen male gymnasts from central reserve police force (C.R.P.F.) gymnastics team and sixteen football players of the inter university team form Lakshmibai National College Of Physical Education, Gwalior. The variables were resting heart rate, fat content (Skinfold thickness),

Hyman Index, Harvard step test, 50-metres dash, leg strength and grip strength. Mean differences of both the groups were tested for significance of differences of both the groups was tested for significance of difference by “t” test. The study revealed that gymnastics exercise has got superior training effect on development of leg strength, Hyman index and reduction of body fat, whereas football can influence more in developing cardiovascular endurance and practice. And gymnastics and football are having more or less the same influence on resting heart rate and grip strength.

Ajmer and Jagtar\textsuperscript{50} conducted a study on physical and physiological characteristics of volleyballers, footballers and cross-country runners. The purpose of this study was to examine the physical and physical


and physiological characteristics of volleyball football players and cross-country runners. Members of the Punjab university volleyball team (Men) (N-12), football team (N-16) and cross country runners (N-15) were tested at the Punjab University Sports Complex. To examine the physical characteristics age, weight and height of the subjects were recorded and skin fold measurements were taken to calculate body fat and lean body weight. Under physiological variables, vital capacity, maximum breath holding capacity, maximum expiratory pressure, heart rate systolic and diastolic blood pressure was taken and dynamic C.P. Index was calculated. Results showed that volleyball players were taller and heavier than footballers and cross-country runners and had higher cardio pulmonary index.

Jha\textsuperscript{51} Conducted a study with a view to comparing and contrasting the selected muscular strength, flexibility and body composition, among swimmers, soccer and volleyball players. Fifteen subjects were taken from each game. They all were three-year B.P.E. and one-year B.P. them were intercollegiate players. He used “F” ratio obtained by one-way analysis of variance, tested for significance at .05 levels of Confidence. The result of the study clearly indicates that their significant differences in each selected muscular strength, flexibility and body composition of swimmers, soccer players and volleyball players.

\textsuperscript{51}Ashok Kumar Jha, “Comparison Of Selected Muscular Swimmers, Soccer And Volleyball Players” (Unpublished Master’s Dissertation, Amravati University, 1988)
From the above 50 reviews it is very clear that not even a single study was found which was directly related to the present study. Hence the topic is a New One.

It was found that some studies in the area of physical fitness are undertaken in some of the universities. The scholar found no study, which was directly related to the present study. Some 50 studies were found which were indirectly related to the present study.