Chapter II
REVIEW OF RELATED LITERATURE

Mrityunjay Biswas, Sangita Halder (2015) the purpose of this study was to compare the anthropometric characteristics and selected fitness variables between women Kho-Kho and Kabaddi players. A total of fifty (N=50) subjects were randomly chosen for this study. Out of 50 players, 25 players were from Kho-Kho and 25 from Kabaddi. The age of the players ranged from 18 to 28 years. The variable undertake for the study are: selected anthropometric variables namely height, weight, arm length, leg length and motor ability test namely abdominal muscle strength endurance (AMSE), leg explosive strength (LES), speed and agility were considered as criterion for the study. All the fitness variables were measured by AAHPER Youth Fitness Test. Mean and standard deviation of each variable were calculated and t-test was computed to analyze the significance of difference between the means. All statistical calculations were done by standard statistical procedure. To determine the differences, if any, between the two groups of players, the independent t-test was calculated. Statistical significance was tested at 0.05 level of confidence. It is concluded from the result that no significant difference was observed between the women Kho-Kho and Kabaddi players. Keywords: Anthropometric, Motor abilities, Fitness Variables, Women, Kho-Kho, Kabaddi.

Anil Kumar (2014), the purpose of the study was to compare the physical fitness variable of Kho-Kho and Kabaddi Players. To fulfil the
objective of the study, (25 Kho-Kho and 25 Kabaddi) players. Only those male players of K.U.K. were selected who have participated at minimum inter collegiate level of K. U. K. The data were collected in different coaching camps organized by the university. The age of the selected subjects ranged from 19 to 25 years. (Standing Board Jump and 60 yard dash tests) were used to measures the selected physical fitness variables of the players. In order to analyze the data t-test was used to analyze the data and investigator observed the significant different between Kho-Kho and Kabaddi players.

Keywords: Kho-Kho, Kabaddi, K.U.K, Strength, Speed.

Gopal Chandra Saha (2012), the purpose of the study was to compare the Anthropometric measurements and Body Composition among Individual and Team Game. The subjects for this study were thirty male students, each from Soccer and Track and Field Intervarsity teams of Lakshmibai National University of Physical Education, Gwalior. They were selected with the view of obtaining scores on selected Anthropometric measurements and Body Composition. The age of the subjects ranged between 18 to 25 years. The variables selected for the study under Anthropometric measurements were Standing Height, Sitting Height, Total Arm Length, Total Leg Length, Upper Arm Girth, Hand Girth, Thigh Girth, Calf Girth and Chest Girth while under Body Composition the variables under taken were body Weight, Percentage of Body Fat and Lean Body Mass. To determine the significant difference between the mean scores of subjects belonging to Soccer and Track and Field on Anthropometric measurements
and Body Composition variables, the ‘t’ ratio was employed. The level of significance chosen was 0.05. The results of the present study indicate that Soccer and Track and Field Athletes did not differ much on selected Anthropometric measurements and Body Composition; however a significant difference in Total Leg Length, Total Arm Length and Standing Height was obtained.

Dhonge (2012) conducted study on the topic of “Co-relation of Kho-Kho Playing Ability with Health Fitness and Motor Fitness of Boys”. The purpose of the study was co-relation of playing Kho-Kho ability of the player of Kho-Kho with motor fitness and health related fitness. In the present study, researcher had studied and measured the health related fitness and motor fitness of the Adolescents Kho-Kho players. For this study and the measurements of Adolescents, the researcher had regularly observed Adolescents play Kho-Kho game fixed period. The objectives of the study were to find out the relationship of motor fitness with playing ability of Kho-Kho player and to study the co-relation of playing ability with health related fitness. Total 243 Kho-Kho players aging between 18 to 25 years groups who have participated as Kho-Kho player in inter-college and inter-university tournament of four districts namely Latur, Nanded, Parbhani and Hingoli of Swami Ramand Teerth Marathwada University, Nanded. The study was based on Survey Method. The piece of research was designed simply on the basis of the principles of developmental Research. A test battery of co-relation of Kho-Kho playing ability with motor fitness was applied to collect the data and the co-relation of the same was established scientifically. After standardization of
the Kho-Kho playing ability of the same was determined by conducting the various tests of fitness and playing ability by which Co-relation Kho-Kho players were identified with the help of the standardized test. The researcher has applied the survey and comparative method. Similarly AAPERD youth motor fitness and health related fitness test battery was used. There were two rating scale tests used to measure the playing ability, offensive and defensive as a source of data. Body Mass Index (Skin fold caliper), Body Fat (Skin fold caliper), Balance (Static Balance test), Cardio-respiratory Endurance (600 Mtrs. Run), Speed (100 Mtrs. Run), Explosive Power (Standing Broad Jump, Arm Strength( Pull-ups ), Abdominal Strength (Sit-ups), Agility Shuttle Run), Playing Ability test (Rating Scale) were used to test the motor fitness and health fitness test. The Mean, Standard Deviation, Factorial ANOVA and Spearman co-relations co-efficient test were used to analyse the data. It was concluded that: 1) Playing ability and Fat, Cardio-vascular ability, balance have close relationship in Kho-Kho players 2) The players of Kho-Kho game have close relationship with playing ability with explosive strength, abdominal strength, arm strength 3) The players of Kho-Kho game have more agility 4) There is no relationship between playing ability and fat.

Nallella & Kumar (2012) conducted a study on “Physical Fitness And its Significance on Physiological Aspects of Football Players in Kakatiya University”. The study was formulated based on the simple random sampling. The samples were collected from the 50 Foot ball players in the age group of 20 - 25 years from kakatiya university in the age group of 18-21 years were
considered. The data were collected during Inter college University Tournaments. The subjects have undergone physical fitness activities for 45 days. The pre-test was taken, and then the post test was administrated after the systematic training of physical fitness activities like speed, agility, explosive power and endurance on physiological aspects. By applying the ‘t’ test the result showed that physical fitness have yielded significant differences on the physiological aspects of foot ball players have scientifically proved better that the Kakatiya university foot ball players have major role to prove their physical fitness in the performance of the game the physical fitness variables.

Ravikumar & Srinivasa (2012) conducted a study “Comparative Analysis of Selected anthropometric And Physical Fitness Variables among Foot- ball Players In Relation To Position Play on 45 university football players of Bangalore University, Tumkur University and University of Mysore who have represented at South Zone Inter-University Football Championship, 2011-12. Anthropometric measurements such height, weight, arm length, leg length, calf girth and thigh girth and physical fitness such as speed, agility, flexibility, endurance were tested. To determine the significance of the differences between the group means in different variables for the defenders, mid-fielders and attackers of foot- ball players, the one-way analysis of variance (F Ratio) was used. The significant was set at 0.05 level of confidence. The Results were found that defenders, mid-fielders and attackers had significant differences in anthropometric measurements such as calf girth and physical
fitness i.e. agility among defenders, mid-fielders and attackers of football players. The study also indicated that defenders, mid-fielders and attackers had no significant differences in anthropometric measurements such as height, weight, arm length, leg length and physical fitness variables such as speed, flexibility and endurance of football players. The mid-fielders had better thigh girth than attackers and defenders. The attackers had superior agility to midfielders and defenders.

Kamble, Daulatabad and Baji (2012) conducted a study, “Study of anthropological parameters, body composition, strength & endurance in Basketball players.” The investigators observed that as compared to the age matched controls the basketball players had significantly more height, height of upper segments of body. Strength of shoulder as well as leg muscles endurance was significantly more in basketball players than controls. We also found that there was a significant decrease in weight, fat percent, and fat mass of basketball players than controls. There was no significant change in height of lower body segment, static strength of leg and back muscles. Summary & conclusion: Basketball players in our study group still lag far behind in different study variables like weight, lean body mass, strength (static as well as dynamic), flexibility and agility when compared with national and Olympic basketball players. Hence there is a need to improve the physical fitness parameters so as enhance the player’s performance. Suggestions: Exercise and games should be mandatory at all levels of education. Talent
identification programs should be implemented at various levels such as schools, colleges, universities and state.


Singh, Parvinder (2012), Anthropometry and physiology play an important role in deciding the particular build of the body with various measurements of the segments of the body it has also its importance in the field of Kabaddi and Kho-Kho game. Somewhat or altogether the body height length of various level and measurements of the varies body segments, pulse rate blood pressure Haemoglobin, vital capacity and body composition have definite effects on the performance of these game players. The investigator in the present study made an effort to test this hunch to compare the difference between the various physiological and Anthropometrical measurements of Kabaddi and Kho-Kho players. The present comparative study is related Kho-Kho and Kabaddi players in relation to anthropometry and physiological variables. In the present investigation, Kho-Kho and Kabaddi players were the field of study. In the present study, 120 male Kabaddi and 120 male Kho-Kho players of Haryana who participated in Haryana Olympic Games and Haryana State Kho-Kho and Kabaddi Championships. The players who remained in last ten teams were selected during the State Championship. To know the difference between Kho-Kho and Kabaddi players in relation to anthropometry and physiological variables, t test was applied. Newline From the results, it
may be concluded that there is a significant difference in weight of Kho-Kho and Kabaddi players. The weight of Kabaddi players is much higher in comparison to weight of Kho-Kho players. It was also concluded that there is a significant difference in linear measurements such as, height, lower leg length, foot length, foot width, total arm length, forearm length, sitting height in comparison to Kho-Kho players. Kabaddi players are found more in weight, weight, height, lower leg length, foot length, foot width, total arm length, forearm length, sitting height in comparison to Kho-Kho players. But no significant difference was found in total leg length, thigh length, upper arm length, hand length, trunk length.

**Nezhad and Farhadi (2012)** conducted a comparison of anthropometric and physiological characteristics of Elite cycling and karate athletes. The purpose of the present study was to comparison anthropometric and physiological characteristics of elite cycling and karate athletes. 23 elite male athletes (Thirteen cyclists with average and standard deviation age of 26.76 ± 2.52 yr, height 174.84 ± 4.21 cm, body mass 69.03 ± 2.82 kg) and ten karateka (age 24.7 ± 2.35 yr, height 180.3 ± 5.65 cm, body mass 79.05 ± 10.16 kg) were tested at the beginning of the season. Cormic index (The ratio sitting height / height), fat percentage (sum of three skin-folds), anaerobic power (Wingate test) and VO2max (Bruce test) were measured. The results were 65 compared between two groups using U Mann-Whitney Test. There were significant difference in VO2max(cyclists 64.69 ml.kg.min, karateka 51.6 ml.kg.min), cormic index(cyclists 53.5%, karateka 52.7%), fat percentage (cyclists 8.48%, karateka 12.87%) and There was no significant
difference in anaerobic power (cyclists 844 watt, karateka 939.3 watt) between two groups (p<0.05). We conclude that should be consider training specific for different sports. The purpose of the present study was to comparison anthropometric and physiological characteristics of elite cycling and karate athletes. 23 elite male athletes (Thirteen cyclists with average and standard deviation age of 26.76 ± 2.52 yr, height 174.84 ± 4.21 cm, body mass 69.03 ± 2.82 kg) and ten karateka (age 24.7 ± 2.35 yr, height 180.3 ± 5.65 cm, body mass 79.05 ± 10.16 kg) were tested at the beginning of the season. Cormic index (The ratio sitting height / height), fat percentage (sum of three skin-folds), anaerobic power (Wingate test) and VO2max (Bruce test) were measured. The results were compared between two groups using U Mann-Whitney Test. There were significant difference in VO2max (cyclists 64.69 ml.kg.min, karateka 51.6 ml.kg.min), cormic index (cyclists 53.5%, karateka 52.7%), fat percentage (cyclists 8.48%, karateka 12.87%) and There was no significant difference in anaerobic power (cyclists 844 watt, karateka 939.3 watt) between two groups (p<0.05). We conclude that should be considered training specific for different sports.

Kumar et al. (2011) on their study were to compare the kabaddi and kho-kho players on the selected physical and mental abilities. The subjects were 50 from the game of Kabaddi and 50 from the Kho-Kho were selected on purposively and randomly basis, who have won medal position in Delhi Scholl Zonal, Inter-Zonal and participated in National School Games during the 2009 and 2010. In their respective sports competition on selected physical and psychological abilities such as Body Mass Index (BMI), Speed, Standing
Broad Jump, Sit and Reach, Sit-Ups, 12minutes Run/walk, Psychomotor ability, Concentration ability and Sports Competition Anxiety. The results show that the significant difference was found in the speed ability of kho-kho players group had better speed in competition to the kabaddi players group. The significant difference was found in the standing Broad Jump in relation to the kabaddi and kho-kho players. The kabaddi players’ group had high explosive strength, showing greater jumping ability than the kho-kho players group.

Sasa Jakovljevic (2011), the aims of this study were: a) to identify the anthropometric characteristics and agility abilities of 14 year-old elite male basketball players, and b) to investigate the influence of anthropometric characteristics on agility test results. The following 11 anthropometric variables were measured on a sample of 50 young basketball players, age 14: four longitudinal measures, two transversal measures, body mass, four circumferences, six skinfolds and, also, 2 derived variables: the body mass index – BMI, and sum of skinfolds – SUM SKF (predictor variables). In addition, the participants carried out 3 agility tests: the agility T-test, zigzag agility drill and 4x15 m agility run (dependent variables). For the assessment of the influence of predictor variables on the dependent variables, a regressive analysis, the Stepwise method, was applied. The results of three regression analyses indicate a moderate, but significant influence of anthropometric variables on agility test results. Longitudinal and transversal measures, body mass, and circumferences had no influence on agility tests results. Only SUM SKF had a significant influence. This variable was extracted.
during the first step in all three regression analyses, and the circumference of
the mid-upper-arm was extracted during the second step in the case of the
dependent variable zigzag agility drill.

**George Abraham (2010),** the purpose of this study was to analyze
the anthropometry and body composition associated with performance of
university level male track and field athletes of South India. This study was
conducted on 93 track and field athletes from South India, comprised of 22
sprinters (100 & 200 mts), mean age 19.5 years, height 172.1 cm and weight
68.2 kg, 20 middle distance runners (800 & 1500 mts), mean age 19 yrs,
height 166.8 cm and weight 62.5 kg, 16 long distance runners (5000 & 10000
mts), mean age 18.7 years, height 167.2 cm and weight 62.1 kg, 20
throwers, (shot, discus & hammer throw), mean age 19 years, height 170.8
cm and weight 72.6 kg and jumpers (High, long & triple jump), mean age
18.3 years, height 169.9 cm and weight 64.1 kg. Besides height and weight,
six skin folds (triceps, chest, subscapular, abdomen, suprailiac & calf), two
bicondylar breadths (humerus & femur) and two girths (biceps & calf) were
measured. Somatotype evaluations were made according to Carter and Heath
(1990) method. BMI was calculated as body mass divided by square of height
(kg/m2). The somatotype chart indicated that sprinters and middle distance
runners are ectomorphic mesomorphs, long distance runners are mesomorphic
ectomorphs while throwers are endomorphic mesomorphs. The jumpers fell
into the somatotype category of balanced mesomorphs. Among all groups
body fat percent is lowest in sprinters (6.23±0.83%) and highest in throwers.
(7.38±0.85%). This was reflected in their endomorphic components which is lowest in sprinters (2.53±0.45) and highest in throwers (3.39±0.65).

Ectomorphic component is highly marked in long distance runners (3.56±0.65) while mesomophy was highest in sprinters (4.31±0.91). Throwers have significantly higher values of skin folds than other groups. Compared to their overseas counterparts, the athletes of both track and field events in the present study exhibited greater endomorphic values. The present data will serve as a reference standard for the anthropometry and body composition of south Indian track and field athletes.

Fahiminezhad (2010) conducted a study, “The study of anthropometric sizes and physical fitness factors of boy students aged 12–14 in Shahrood city.” The aim of this study was to study of anthropometric sizes and physical fitness factors of boy students aged 12–14 in Shahrood City. This cross-sectional study was performed on 368 boy students aged 12–14 years in Shahrood (2010). Subjects were selected via random sampling. Anthropometric measurements included: height, weight, sitting height, arms span, body mass index (BMI), waist circumference (WC), waist to hip ratio (WHR), and percentage body fat (BF%) and physical fitness components included: cardiorespiratory fitness (20- m shuttle run test), general strength (dynamometer back and leg), leg power (vertical jump test), flexibility (sit and reach test) and agility (Illinois test). The mean of height (cm), weight (kg), sitting height (cm), arms span (cm), BMI (h/w2), WC (cm), WHR and BF% subjects were 154.1, 43.4, 77.1, 155, 18, 67.6, 84 and 22, respectively. The mean of VO2max (ml/kg/min), general strength (kg), leg power (kg/m),
flexibility (cm) and agility (s) were 49.6, 92.1, 56.9, 30.5 and 18.97, respectively. There was significant negative correlation between VO2max and anthropometric measurements, agility with height, flexibility and leg power, while a significant positive correlation was found between general strength and leg power with anthropometric measurements subjects. Survey results showed that 12-14-year-old boy students in Shahrood were of thought height, weight, BMI, general strength and leg power lower from adolescents of other countries and height, weight, BMI almost equal and general strength and leg power higher from adolescents of our country. Also 12-14-year-old adolescent boys in Shahrood on base BMI 30.5%, BF% 26.9%, 61 WHR 16.8% and VO2max 10% may provide insight into the prediction of future risk chronic disease.

**Hassan (2010)** conducted a study to find out the relationship between anthropometric and physiological variables elite distance and middle distance runners of Iranian national team. The purpose of this research is to define the relationship between anthropometric and physiological variables in elite distance and middle distance runners of Iranian national athletics team for the 3000 m performance. To do this, a sample of 30 elite runners with the mean age of 21.10±0.63 and mean height of 177.8±5.82 and mean weight of 64.26±7.07 were used. Characteristics of anthropometric and physiological and their relationship for the athletes were measured. The Pearson regression with (p≤0.05) was used for this analysis. From 41 variables 8 of them had a meaningful relationship with the performance of athletes which from these body fat mass (kg) and percentage of fat (%) had a positive and meaningful
relationship with the performance and a negative and meaningful relationship between distribution of fat and performance. Between VO2max (ml/min/kg), anaerobic power, VO2max LT (ml/min) and the performance there was a negative and meaningful relationship. Between rest heart rate, breath rate and the performance there was a positive and meaningful relationship.

Pilli (2010) conducted a study, “Comparison of anthropometric and physical variables among kho-kho and handball players of Andhra Pradesh School Games teams.” The purpose of the study was to compare the anthropometric and physical variables among kho-kho and handball players of Andhra Pradesh School Games teams. To achieve this purpose of the study, 40 male players of kho-kho and handball were selected as subjects from Andhra Pradesh State School Games teams. The players who were selected as subjects for the studies have participated at national level competition. The age of the subjects were ranged between 16 and 20 years. The following variables such as speed, endurance, explosive strength, muscular endurance, height, weight, sitting height, body fat and somatotype were selected as criterion variables. The analysis of ‘t’ ratio was used to analyse the significant differences if any between the groups. The level of significance was fixed at 0.05 level of confidence, which was considered to be appropriate. The result of the study shows that handball players were better in six variables such as explosive strength, muscular endurance, height, weight, body fat, somatotype, further the study indicates that kho-kho players were better in speed and endurance.
**Singh (2010)** conducted a study of anthropometric, physical and physiological parameter as predictors of volleyball performance. The subject for the study were fifty male and fifty female volleyball players selected randomly, from a population of all the volleyball players who participated at university level. In this study the coefficient of correlation between selected variables of age, weight, standing height, sitting height, Arm length leg length, shoulder width, elbow width, hip width, knee width, chest circumferences, upper arm circumference, arm circumference, and calf circumference were 0.106, 0.227, 0.510, 0.337, 0.257, 0.276, 0.259, 0.092, -0.174, 0.002, -0.079, 0.152, 0.129, 0.276 fore respectively. Only standing height (0.510) and sitting height (0.337) showed a positively significant correlation with volleyball playing ability as assessed by a panel of experts.

**Talwar (2010)** conducted a study, “Kinanthropometric backup to core group probable of 2010. Kinanthropometry is the basic sports science, knowledge of which is extremely important to find out the performance excellence in the competitions. Requirement of body structure with regard to suitability of the sport is pre-requisite for being an athlete. In the present article, complete kin-anthropometric backup provided to various core group probable of 2010, in the sport disciplines of track and field, boxing, cycling and wrestling will be discussed and efforts will be made to present the normative values of various anthropometric parameters pertaining to these elite level Indian athletes.
Campos, F. A. D et. al (2009), this study aimed at assessing the anthropometric profile and motor performance of young badminton athletes. The sample included 20 athletes (10 male athletes, mean age 17.24±1.18 years and 10 female athletes, mean age 15.21±2.06 years) playing in the Brazilian junior badminton team.

The following variables were assessed: body weight; height; skinfold thicknesses; abdominal strength/resistance; medicine ball throw; 20-meter speed; vertical jumps: vertical squat jump, countermovement vertical jump; and aerobic power. Descriptive statistics (means and standard deviations) and student’s t-test were used for data analysis. Differences were considered significant at the level of p<0.05. The results found in this study regarding male and female athletes were, respectively: body weight (68.0±7.8 and 61.74±6.85 kg), height (172.4±0.5 and 163.8±0.3 cm), sum of seven skinfolds (83.21±22.02 and 131.58±29.36 mm), abdominal strength/resistance (33±3.3 and 28±5.8 n), medicine ball throw (7.54±1.01 and 6.98±0.78 m), 20-meter speed (3.12±0.08 and 3.5±0.14 seconds), vertical squat jump (36.7±6.0 and 27.2±2.1 cm), countermovement vertical jump (39.3±5.7 and 28.1±2.4 cm) and VO2max (49.68±2.48 and 42.92±2.94 ml/kg/min-1). The results of this study describe anthropometric and motor test characteristics of young athletes playing in the Brazilian junior badminton team. They can also help coaches in identifying and choosing new badminton athletes.
Bandyopadhyay (2007) undertook a project to compare anthropometric and body composition variables of volleyball and soccer players. For this he selected 50 sedentary males and 128 sports persons (volleyball=82, soccer=46) between 20-24 year from west Bengal, India. He conducted skinfolds girth measurements, body fat percentage (%fat, and endomorphy were significantly higher among sedentary individuals, but lean body mass(LBM) and mesomorphy were significantly(p<0.05) higher among the sports persons. soccer and volleyball players were found to be ectomorphic-mesomorph, whereas sedentary subjects were endomorphic mesomorph. The soccer and volleyball players had higher % fat with lower body height and body mass than their overseas counterpart’s % fat exhibited a significant correlation with body mass index (BMI) and thus prediction equations for % fat from BMI were computed in each group.

Hasan, Rahaman and Cable and Reilly (2007) conducted a study, Anthropometric Profile of Elite Male Handball Players in Asia. They observed that anthropometric profiles of elite athletes provide insights into the requirements for competing at top level in particular sports. Due to the comparative lack of data for contemporary handball players, the present study was conducted to describe the anthropometric characteristics of international male Asian handball players and identify any positional differences existing. Sixty three players from five different countries were measured in the 12th Asian Games in Hiroshima for height, mass, skinfold thicknesses and estimates of body fat and muscle mass. Results were compared with data for
the English 58 handball squad for reference purposes. Significant differences were evident among the Asian teams, the group from East Asia being taller and lower in adiposity than the teams from West Asia. A relative homogeneity was observed among positional roles. The more successful teams were taller and had lower body fat than the less successful teams. It is concluded that Asian handball players differ in anthropometric characteristics from European players previously studied and that specific anthropometric variables are associated with successful tournament performance at international level in Asia.

Dhill (2007) conducted a study on Kabaddi and Kho-Kho players of Maharshi Dayanand University team. He compared skinfolds measurement and body composition variables these games players. The skinfold measurement such as biceps, triceps, suprailiac, thigh and calf Kabaddi players were found significantly better than compare to Kho-Kho players. Kabaddi players were significantly better than the Kho-Kho players in body composition variables such as Fat%, Fat weight and lean body mass. Kho-Kho players were significantly better than the Kabaddi players in body composition variables such as body density.

Bayios, Bareles, Apostolidis, Noutsos and Koskolou (2006) conducted a study. The aims of the present study were: a) to determine the anthropometric profile, body composition and somatotype of elite Greek female basketball (B) volleyball (V) and handball (H) players, b) to compare the mean scores among sports and c) to detect possible difference in relation
to competition level. A total of 518 female athletes, all members of the Greek first National league (A1 and A2 division) in B, V, and H sport teams participated in the present study. Twelve anthropometric measures required for the calculation of body composition indexes and somatotype components were obtained according to the established literature. Five athletes were the tallest (p<0.05) among the three groups of athletes, had the lowest value of body fat (p<0.05) and their somatotype was characterized as balanced endomorph (3.4-2.7-2.9). B athletes were taller (p<0.05) and leaner (p<0.05) and their somatotype was mesomorph-endomorph (4.2-4.7-1.8). In comparison with their A2 counterparts the A1 division players were taller (p<0.05) and heavier (p<0.05), but at the same time leaner had exhibited higher homogeneity in somatotype characteristics (p<0.05). Anthropometric, body composition and somatotype variable of Greek female elite team ball players varied among sports; selection criteria hours of training and sport-specific physiological demands during the game could explain the observed differences.

**Duncan, Woodfied, al-Nakeeb (2006)** conducted a study to investigate the anthropometric and physiological characteristics of junior elite volleyball players. Twenty five national level volleyball players (mean (SD) age 17.5 (0.5) years) were assessed on a number of physiological and anthropometric variables. Somatotype was assessed using the Heath-Carter method, body composition (% body fat % muscle mass) was assessed using surface anthropometry, leg strength was assessed using a leg and back dynamometer, low back and hamstring flexibility was assessed using the sit
and reach test, and the vertical jump was used as a measure of lower body power. Maximal oxygen uptake was predicted using the 20m multistage fitness test. Setters were more ectomorphic (p<0.05) and less mesomorphic, ectomorphy) for setter and centers was 2.6 (0.9), 1.9 (1.1), 5.3 (1.2) and 2.2 (0.8), 3.9 (1.1), 3.6 (0.7) respectively. Hitters had significantly greater low back and hamstring flexibility than opposites. Mean (SD) for sit and reach was 19.3 (8.3) cm of opposites and 37 (10.7) cm for hitter. There were no other significant differences in physiological and anthropometric variables across playing positions (all p>0.05). Setters tend to be endomorphic ectomorphs, hitters and opposites tend to be balanced ectomorphs, whereas centers tend to be ectomorphic mesomorphs. These results indicate the need for sports scientists and conditioning professional to take the body type of volleyball players into account when designing individualized position training.

**Niels Uth (2005)**, the present study compared the anthropometry of sprinters and people belonging to the normal population. The height and body mass (BM) distribution of sprinters (42 men and 44 women) were statistically compared to the distributions of American and Danish normal populations. The main results showed that there was significantly less BM and height variability (measured as standard deviation) among male sprinters than among the normal male population (US and Danish), while female sprinters showed less BM variability than the US and Danish normal female populations.

On average the American normal population was shorter than the sprinters. There was no height difference between the sprinters and the
Danish normal population. All female groups had similar height variability. Both male and female sprinters had lower body mass index (BMI) than the normal populations. It is likely that there is no single optimal height for sprinters, but instead there is an optimum range that differs for males and females. This range in height appears to exclude people who are very tall or very short in stature. Sprinters are generally lighter in BM than normal populations. Also, the BM variation among sprinters is less than the variation among normal populations. These anthropometric characteristics typical of sprinters might be explained, in part, by the influence the anthropometric characteristics have on relative muscle strength and step length.

**Jawis MN et.al (2005)** Anthropometric and Physiological profiles of national speak takraw players were determined. Thirty nine players, specializing in the three playing positions (tekong/server, feeder and killer/spiker) were divided into three age categories of under 15 (U15), under 18 (U18), and under 23 (U23) years of age. Height, weight, percent body fat (%bf), maximum oxygen consumption (Vo2 max), range of motion (ROM), back and leg strength, and heart rate, for the estimation of oxygen consumption during matches were recorded. Statistical analysis was performed using one way ANOVA for independent measurements and data are presented as mean +/-standard deviation. The U23 players were significantly taller and heavier with significantly better Rom of the neck, trunk, and ankle joints and back and leg strength than the U15 group when compared to the U18 and U23 groups (p<0.05). Mean Vo2 max was similar between the three groups. Estimated oxygen consumption during matches
was 69.1%, 68.5%, and 56.4% of Vo2 max in the killer, tekong, and the feeder groups, respectively. The mean height, body weight, and cardiopulmonary capacities of the players were within the Malaysian population norms, but were somewhat lower than those of players of other court games from other countries. %bf was also lower in these players. This study provides the much needed anthropometric and physiological data of sepak takraw players for further development of this sport.

**Monsma and Malina (2005)** conducted a study on anthropometrics and somatotype of competitive female figure skates (11-22 year) by level of competition and discipline. The results suggest that figure skating favours lightness, high mesomorphy and lower endomorphy as elitic levels.

**Kaur (2004)** conducted a study on comparison of anthropometric components between forwards and defenders in female soccer players. The researcher had collected data on 40 soccer players (20 offensive and 20 defensive) of inter college level, from various colleges affiliated with Punjab University Chandigarh. The researcher selected 10 anthropometric variables namely weight, height, sitting height, leg length, arm length, hip width, ankle width, foot length and calf circumference. The data was collected on play field of Gurusar Sudhar college campus. It was found that defensive players were superior to offensive player in maximum all variables.

**Kaur et al. (2001)** in their study measured the anthropometric attributes of 17 junior basketball male players attending national camp for the preparations of an international championship. It was important to observe
that out of 17 players; only 6 have fallen in the required Olympic Somato type circle. On the whole, it was observed that Indians were still smaller in height and lighter in their body mass and required somato type development to be the best successful basketball players; they also mentioned that certain anthropometric attributes were used in predicting excellence in junior elite basket ball players.

Christine and Jacob (2000) conducted a study, “Physiological and anthropometric determinants of sport climbing performance” to identify the physiological and anthropometric determinants of sport climbing performance. Methods—Forty four climbers (24 men, 20 women) of various skill levels (self reported rating 5.6–5.13c on the Yosemite decimal scale) and years of experience (0.10–44 years) served as subjects. The results indicated that these were labelled training, anthropometric, and flexibility on the basis of the measured variables that were the most influential in forming each component. The results of the multiple regression procedure indicated that the training component uniquely explained 58.9% of the total variance in climbing performance. The anthropometric and flexibility components explained 0.3% and 1.8% of the total variance in climbing performance respectively. The variance in climbing performance can be explained by a component consisting of trainable variables. More importantly, the findings do not support the belief that a climber must necessarily possess specific anthropometric characteristics to excel in sport rock climbing.
**Toor (1996)** conducted a study to investigate physical, physiological and anthropometric determinants of performance in female inter-college level sprinters and 100 throwers. Ten physical, ten physiological and twenty anthropometric measurements were taken. The finding of the study: (i) The sprinters’ performance was significantly related to physical variable namely sit up, sergeant jump, standing broad jump, back lift and 50-years dash, physiological variables namely relating age and calf circumference; (ii) Performance of jumpers was found significantly related to physical variable namely sit ups, sergeant jump and standing board jump. Anthropometric variable namely age and bicep skin fold; (iii) The performance of throwers was found significantly related to chest, normal chest, expanded variable, elbow width, shoulder width, chest width, knee width and hip width, weight variables.

**Kumar (1995)** studied the relationship between selected anthropometric variables and performance in athletics Program of high school and senior secondary school students. He concluded that performance in all running events 100 meters, 200 meters, 400 meters 800 meters 1500 meters 5000 meters And 10,000 meters events have significant relation with age.

**Muthian and Venkateshwarlu (1973)** studied the Asian track and field athletes and noticed that the throwers to be heavier, taller and older than, other athletes. Among the runners, the age increased and the height, weight decreased with the increase in the distances they run. The jumper and the hurdlers were taller and heavier than sprinters but were shorter and
lighter than throwers. The decathletes were the second heaviest as they were all rounder.

Vaz (1994) investigated some of the selected anthropometric characteristics and physical fitness components of predictors of performance in Judo. He found in his study that anthropometric variables namely, height, weight, calf girth, arm girth index, were related to Judo Performance in various weight categories, but by length, thigh girth and rural ratio were not seen significantly related to Judo performance.

Chandel (1993) conducted a comparative study on physical fitness, physiological and anthropometric variables between the tribal and non-tribal, two hundred sixty tribal and 220 non-tribal students were taken as subjects of the study AAHPER youth fitness test battery consisting of six test items sit up, pull up, standing jump, 50 yard dash shuttle run, 600 yard run-walk was used to measure physical fitness of the subject Selected physiological parameters such as pulse rate, blood pressure and haemoglobin were measured and some anthropometric measurement were taken.

The following conclusions were drawn,

1. a significant difference in mean score of anthropometric variable was found in favour of the tribal. They were found heavier in weight, better in height, possessing broader shoulder, wider chest – cavity, bigger hip thigh and calf circumference.
2. The tribal were found superior in all the physical fitness variable, as significant mean difference were found in their favour in sit up, standing
broad jump, shuttle run, 50 yard dash, 600- yard run/ walk. Hence it
could be safely concluded that the tribal were superior in speed, agility
and endurance.

3. The tribals are superior to non-tribal in physical- fitness, cardiovascular
endurance and anthropometric measurements. At the national school
levels, arm circumference and shoulder were significant with none of the
anthropometric measurements.

**Chauhan (1987)** studied the relationship between selected
anthropometric variable and endurance running performance. He concluded
43 that 5000m and 10000m runners are shorter in stature, lighter in body
density and control groups. 1500 meters runners have better linear
measurements than other endurance runner's but they have almost similar
skinfolds measurements.

**Tanaka and Matsura (1982)** studied the anthropometric and
Physiological variables of 114 Japanese young middle and long distance
runners and concluded that the anthropometric attributes would predict the
distance running performance to about the same degree as physiological
attributes. As a result of factor analysis and the multiple regression and
analysis three factors i.e., Linearity of Physique, girth of Physique and
subcutaneous fat, were extracted and the first two factors were nearly equally
related to the 800 meters, 1500 meters and 5000 meters performances.
10000 meters, however, was best accounted of the second factor.
Khanna et al. (1983) study consisted of seven judo players and fourteen normal subjects of sedentary habits. On the first day their anthropometric characteristics including body fat percentage grip strength and anaerobic power were measured. On the second day, their maximum aerobic power was determined. Body fat percentage was determined by measuring the skinfold thickness over four different sites, namely biceps, triceps, suprailliac and subscapular regions with skinfold Caliper.

Pollock and Pate (1980) conducted this investigation to evaluate and quantity physiological difference among groups of distance runners. The subjects included 20 elite distance runners (8 marathon, 12 middle - long distance and 8 good runners.). Working capacity and cardio-respiratory functions were determined by sub-maximal and maximal treadmill tests and body composition by hydrostatic weighting machine. The variables studied were maximum oxygen uptake, VO-2 sub-maximal, lactic acid, sub max. lean body (P < 0.5) weight, fat weight, ANOVA sowed that the good runners differed from elite runner (P < 0.1) and the distance runners (P < 0.5). 39 Discriminate analyses showed that the both functions were significant. The first was general physiological efficiency factor that separated the good and elite runners. The second separated the elite marathon and middle long distance groups. The second function showed that the marathon runners had lower lactic acid sub maximum value. The middle-long distance runners had higher VO-2 maximum values. Drinkwater and Ross (1980) conducted a study to observe present status of sport anthropometry owing to the results of descriptive investigations new demand has appeared in sport anthropometric
research. The focus of the new investigations became the analysis of the relationship between anthropometric characteristics and physical, physiological functions. Two research groups - the Central School of Sports and the Department of Health Sciences and Sports Medicine - play a definite part in this area of human biology and are supported by MYS and HOC. Their technical repertoire has developed during the past 10 years, and in addition to using traditional anthropometric methods they have the facilities to measure aerobic and anaerobic exercise performances as well as the exercise changes in cardiorespiratory function. Their traditional anthropometric repertory has increased by the four-component (bone, muscle, fat and residual volumes) estimation of body composition.

Hauston and Green (1976) conducted a study on be Hockey pertaining Physiological and anthropometrical characteristics and concluded that there were few significant differences. Junior forwards were lean than university forwards (9.4 vs. 12.4% body fat). By position, defensemen were significantly taller (180.0 Centimeters vs. 176.2 centimeters) in all other measures no significant differences were noted 38 Budet (1979) stated that Physiological parameters involved in oxygen transport were compared in men women similar aerobic capacities as assessed by maximum oxygen uptake. In parameters of cardiac output divided by body weight, hemoglobin concentration and body fat were assessed to detect differences that might exist due to sex or fitness level. The statistical analysis indicated that cardiac output increased with fitness level and was greater in men; cardiac output divided by body weight, increased with increases in fitness level but showed
no differences due to rest. Haemoglobin concentration gas greater in men but did not vary due to fitness level. Percent body fat was greater in women and decreased with increased fitness level. Bhatnagar (1980) conducted “A study on 23 rural sportsman (Athletics’ 8, Kabaddi 7 and volleyball 8) of Madhya Pradesh (India) pertaining to their weight, height and sub cutaneous tissue fold at biceps, triceps, supraliea and sub-scapular region. They have been found to be lighter, shorter with less amount of fat as compared to normal urban Punjabis. More Physiological differences pertaining to sportive activities indicates that volleyball players are lightest-shortest with maximum amount of fat compared to Kabaddi players and athletes whereas Kabaddi players are heaviest and fatest among the rural sportsman of Madhya Pradesh.