CHAPTER-II

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In the words of Best, “A familiarity with the literature in any problem area helps the students to discover what is already known, what others have attempted to find out, what methods have been promising and disappointing and what problems remain to be solved.”

According to Walter R. Barg, “The literature in any field forms the foundation upon which all further work will be build. Without knowing the past, we cannot do something new in the field of research. If we want to do some new work in a subject, it is very necessary that we should know that subject.”

Literature means writings and a body of literature refers to all the published writings in a particular style on a particular subject. In research, a body of literature is a collection of published information and data relevant to a research question. A literature review is a body of text that aims to review the critical points of current knowledge including substantive findings as well as theoretical and methodological contributions to a particular topic. A literature review is an account of what has been published on a topic by accredited scholars and researchers. Typically, the literature review forms an important chapter in the thesis, where its purpose is to provide the background to and justification for the research undertaken (Bruce, 1994).
A literature review can be defined as the selection of available documents (both published and unpublished) on the topic, which contain information, ideas, data and evidence written from a particular standpoint to fulfill certain aims or express certain views on the nature of the topic and how it is to be investigated, and the effective evaluation of these documents in relation to the research being proposed (Hart, 1998). A literature review can be a precursor in the introduction of a research paper, or it can be an entire paper in itself, often the first stage of large research projects, allowing the supervisor to ascertain that the student is on the correct path. A literature review is a critical and in depth evaluation of previous research. It is a summary and synopsis of a particular area of research, allowing anybody reading the paper to establish why you are pursuing this particular research program. A good literature review expands upon the reasons behind selecting a particular research question.

In this study, the different aspects of the volley ball players for their selected coordinative, psychomotor and physiological variables has been studied. For the purpose of this study some of the related literature has been collected which will help the researcher for his study.

2.1 COORDINATIVE ABILITY

A study was conducted by Espenchade (1947) on development of motor co-ordination of boys and girls in 1947. She used Brace Test to find out the components of
motor co-ordination such as agility, balance, flexibility body control and strength. The test was administered to boys and girls age ranging 13 and 17 years.

On the basis of the study done by Meyers (1967) on "retention of balance co-ordination learning as influenced by extended Lay" he took each of 5 groups of senior high school girls (N=20 per group) were initially given 10 trials on the Bachman Ladder Climb Task, and then given a different length of lay-off (10 minutes, or 1 day, or 1 week, or 4 weeks, or 13 weeks) before being retested with another 10 trials. No significant loss in retention or credence of reminiscence or warm up decrement was formed across the lay-off periods.

Toyoda, H.A. (1971) found out through an investigation that the volleyball players have different types of requirements according to the nature of the activity. He concluded that a volleyball player requires muscular strength and power, muscular as well as cardio-respiratory endurance, agility and speed of movement flexibility of muscles and joints, ability to control body movements like timing, rhythm, balance or coordination and relaxation and coordination of the whole body. These elements were found to have a significant relationship with the skills in volleyball.

Black and Johnson (1975) studied the effect of swimming training on reaction time of athletes who were non swimmers. Result of this study indicated the reaction
time of college athletes was improved during swimming instruction as compared to the control group.

**Manilal, Sabastian and Thomas (1990)** conducted a study to compare the coordinative abilities of junior India Basketball players and Junior Indian Volleyball players. Twenty-one girls who have attended the Junior Indian Volleyball coaching camp were selected as subjects. For coordinative ability test suggested by Peter Hirtz were administered to evaluate the coordinative abilities of the subjects. The ‘t’ test was employed to determine the mean difference in different coordinative abilities between volleyball and basketball female players. The result also showed that the volleyball players have better space orientation ability and reaction ability than the basketball players.

**Baskshi (1994)** conducted a study on 2 groups of sports persons on coordinative abilities. The two groups were the track and field athletes and swimmers. These groups were chosen because both the activities involved cycle type of movements. They were tested on the activities test on suggested by Peter Hirtz. The subject chosen were either of level of inter-collegiate level or of inter-university level. Another observed the test revealed that there is no significant difference in coordinative abilities of swimmers and track & field athletes except for their Orientation and Balance ability.
Archita Koley (1999) conducted a study on relationship of coordinative abilities to sprinting performance in sprinters. The result of the study shows that, the reaction ability, orientation ability and balance ability had significant relationship to sprinting performance.

Gouranga Saskar (1999) tested the relationship of coordinative abilities to shooting performance in soccer on 25 male football players. The findings reveal that there were no significant relationships of the coordinative abilities to shooting performance in soccer. The findings were, there is no significant relationship between shooting performance and coordinative abilities of footballer.

Milenko Vukovic (2009) the subject of the research in this paper is the motor abilities of volleyball players and tests for their assessment. Under the term general motor abilities we imply the motor abilities which can be found in other kinds of sport according to their general characteristics: coordination, strength, speed, endurance, flexibility, balance, and precision. Specific motor abilities are the motor abilities that are specifically developed in each sports branch, taking into account that they are not completely new motor abilities, but the abilities that are “built” out of the general motor abilities by specific training or they are combined into specific motor abilities for each individual sport. On the basis of consulted works, the majority of volleyball experts under the term of specific motor abilities imply the following: explosive strength and
agility, flexibility, body coordination, alternative movements speed, limbs coordination. In the concluding part of the work there are tests that are most often used for estimation of general and specific motor abilities of volleyball.

**Hanan Mohamed Ahmed Geasa (2010)** the purpose of this study was to identify the impact of the educational program to improve the coordinative abilities on learning some offensive skills in handball for preparatory school girls (second grade). An experimental one-group design method was used in a sample of 30 second grade girls from Alnahda preparatory school, Assuit province. The researcher designed two experts' questionnaire forms to indicate the most appropriate abilities for the subjects, determine the tests of coordinative abilities scale and prepare the proposal educational program; physical and skill tests. The findings showed that there is a correlative relation between the coordinative skills and the level of offensive skills performance in handball (under research). The researcher recommends improving the coordinative abilities in the educational program by influencing speed of learning and acquired motor skills

**A. Pacuraru, C. Preda, L, Ciocoiu (2010)** concluded that Nowadays we are witnessing a phenomenon of acceleration in terms of physical and mental development of the young generation, which compels us to reconsider the characteristics of the age 7-9. Specialised literature treats coordination as an”orderly activity of various organs and
systems of the body, conditioned by the excitation and inhibition occurring in the central nervous system” (Georgescu F., 1971: 97). Shepard R. J.(1994: 7) defines coordination as “an integral process of actual management of the movement in accordance with the purpose, the environment conditions, the athlete’s state and his personal characteristics”.

Ehab Mostafa Kamel and Mahmoud Houssain Mahmoud (2011) the process of defining the level of dynamic performance of basketball juniors is a very important process because it is difficult to define such a level through observing the performance of the player during the sports competitions. This because of the interference of many effective factors affecting this performance such as the nature of the competition, the level of the competitors and the reactions of the partners, competitors and referees, so it is necessary to follow the correct scientific ways to identify the coordination abilities of beginners. This research aims at identifying the working force structure of the coordination abilities of female basketball beginners, so it designs a sort of testing battery as an index of measuring and evaluating these abilities, The two researchers used a descriptive methodology (surveying study) on a sample of 70 basketball beginners under the age of 14 in some Cairo and Giza clubs in the sports season 2009/2010, Within the limits of the research and through the statistical analysis and discussion of the tables, we can reach the following conclusion Designing a testing battery
as an index to measure and evaluate the direct abilities which are found in female basketball beginners, including 8 tests to measure 2 strong factors (the ability's for balance, orientation and dynamic organization and the ability's for distinction and rhythmic response.

**Raghupathi K (2013)** concluded that Childhood is considered one of the most important stages in man’s life. During this stage, a child’s abilities develop and his talents mature and they gets suitable and passive. The study on physical growth of children is the most important criteria for recognizing health of children. Increase in height and weight are the clinical sign of growth. Coordination is about controlling all of body parts while doing different activities of children. It is about making and maintaining connections between the brain and the muscles that control movement of the children. The purpose of the study was to compare the physical growth and coordinative abilities between urban and rural school going boys. For this purpose One hundred eighty boys age ranging from 10 to 15 years were selected as subjects for the study of which ninety were urban and the remaining ninety boys were rural school going from different schools of Bangalore District, Karnataka. The subjects were tested their respective school ground for a week. The criterion measures included are height, weight and chest circumference, differentiation ability was used measured by backward medicine ball throw test; hand-eye coordination was used measured by alternate hand wall toss test. For the purpose of comparison of above
criterion variables between rural and urban school going boys, ‘t’ ratio statistical technique was used to analyze the data through SPSS package. The level of significance was set at p<0.05 level. The results showed significant differences between rural and urban school going boys in the physical growth and coordinative abilities. There is a need to create awareness among rural school children and their parents about physical growth and health which can be improved by providing proper care and nutrition right from early childhood period. Comparative Analysis of Physical Growth and Keywords: coordinative capacity, primary school.

2.2 PSYCHOMOTOR VARIABLE

Wilmore and Haskell (1972) studied on body composition of professional football players. FVC was measured using a Collins 9-1 Spiro meter. These athletes were given work capacity test on either a bicycle ergo metered or treadmill during which time measurements were made to heart rate VE and VO₂. VO₂ max and VE ranged between 33.0 60.0 ml/ Kg min.

William, Jack H. and Haskell, Wilson L. (1972) conducted study on body composition endurance capacity of professional football players. The body composition was assessed on 44 professional players using hydrostatic weight technique. Residual volumes well measured using a Collins 9-1 Spirometer In addition, 17 of these athletes were given work capacity test on either a bicycle ergo meter or
treadmill during which time measurements were made to heart rate VE and VO$_2$max. Relative body part range between 4.0 and 29.2 % weight between 30.6 and 143.4 Kg and lean weight between 73.1 and 106.6 Kg RV ranged between 0.966 and 2.457 VC between 4.315 and 7.551 liters, and TLC between.

**Coleman (June 1974)** studied nine college basketball athletes to determine the effects of a season of competition on the aerobic and anaerobic energy sources, pre and post season variable of testing and recovery heart rate performance of the treadmill test (time) maximal oxygen intake and the sources of Margaria Anaerobic capacity test (Vertical velocity) were studied analysis of data yielded no significant decrease in recovery heart rate, treadmill performance time and VO2 max a non-significant increase in resting heart rate and anaerobic power and a significant increase in vertical velocity from pre and posttest. The result of this investigation suggested that running in basketball was of sufficient intensity to maintain cardio respiratory function and improve anaerobic performance.

**Withere, R.T., Roberts, R.G.D. and Davies, G.D., (1977)** compared the aerobic power anaerobic power and body composition of South Australian male representative in athletics, basketball, field hockey and soccer. The runners and walkers exhibited the highest mean VO2 max, there was virtually no differences between the hockey and the soccer players. Soccer much higher than runners and
walkers in absolute players. The scores of the hockey and soccer players were longer arm wider biliac, slower sprit time and greater upper and lower body strengths than the volleyball players

**Surinder (1979)** conducted a study on relationship of vital capacity and cardio-vascular fitness with performance in race. It was found that vital capacity and cardio-vascular fitness had positive and significant relationship to performance in race. To measure vital capacity Spiro meter technique was used and cardio-vascular fitness was measured through modification form of Harvard step test. The results showed significant relationship.

**Barrow, H.M. and Rosemary (1979)** have emphasized “the importance of balance and ability in various sports activity and their physiological mechanism. They have opinioned that balance is an important aspect of efficient motor response and is one of the basic motor factors. It is the ability of an individual to maintain his neuromuscular system in static condition for an efficient response on training control it in a specific efficient posture while it is moving. The first type of balance is static and the other is dynamic. Both are basic to movement under varying conditions. Both indicates a certain amount of steadiness and stability and characterized a certain amount of case and poise in maintaining position.

**Martin, B.J, Stager, J. M. (1981)** the measures of respiratory muscle strength and endurance has been
studied on athletes and non-athletes for several years. It has been found that people who engaged in regular exercise had greater ventilator endurance. It also reported increase in VO₂max and Vital capacity when regular exercise is done.

**Bult, Nany Key (1982)** tested 127 high school female cross country runners present body fat rating a received exertion and maximal oxygen consumption during a continuous running treadmill test. These young runners (X=15.6 years) were running approximately 25 miles per week. They have an average VO₂max of 50.8 ml min⁻¹ and HR of 19.8 bpm. The present body fat, as determined by hydrostatic weighing was 15.47. The onset of metabolic acidosis was estimated to occur 78% VO₂max a stepwise multiple with 3000 meter run as the dependent variable indicated the max. treadmill run time, weight relationship VO₂ max and VE max entered the equation in that order, yielding an R of 0.67 Both HR eegometrt: Comparison between Trathletes and Swimmers. They compare maximal heart rate (HR max), maximal oxygen consumption (VO₂max), and the ventilatory threshold (VT; %VO₂max) during cycle ergometry and free swimming between swimmers and triathletes. This study confirms the exercise testing mode affects the VO₂ max value and the swimmers have very specific training adaptations even compared with the triathletes. This may be a function of acute psychological responses combined with specialist training status of the different athletes influencing maximal cardiac output or oxygen extraction. In contrast, the different
training regimens do not seem to influence the VT, as this variable did not differ between the two testing modes in either group of hypoxia can increase hemoglobin mass even in world class athletes, which may translate into improved performance at important competitions at sea level.

Khanna GL, Majumdar P, Malik V, Vrinda T, Mandal M.(1994) to determine the physical and physiological profile of kabaddi players and the physiological demands of playing a kabaddi match. Maximum aerobic capacity (VO$_2$max), maximum ventilation (VO$_2$max), O$_2$ pulse, respiratory equivalent (RE), maximum heart rate, and O$_2$ debt were assessed on 16 players. The somatotype of the players was calculated by the Health and Carter method. Heart rate was monitored during a selection trial match on eight players who represented India in the Asian Games, 1994. From the playing heart rate, oxygen consumption (VO$_2$) was computed through a heart rate v VO$_2$ regression equation. Maximum lactate was evaluated from the blood samples collected at the end of the match. The average heart rate and oxygen consumption during the match were 146.5 (SD 9.25) beats min$^{-1}$ and 2.25(0.59) liter min$^{-1}$ respectively. During raiding the maximum heart rate attained varied from 162.4(11.3) to 177.4(4.2) beats min$^{-1}$. Out of 40 min of match play a raider raided on average on 8.13(2.03) occasions. The average time per raid was 20.8(6.26) s. The match heart rate and oxygen consumption was 72.3-83.3% of the maximum heart rate, and 43.5-70.5% of VO$_2$max respectively. Maximum lactate at the end of the match was
6.13(2.53) mmol litre⁻¹. Kabaddi players had the somatotype of 2.68-4.71-1.83, with absolute back strength of 175.0 kg. VO₂max and O₂ debt were 3.59(0.36) litre min⁻¹ [47.82(3.68) ml kg⁻¹ min⁻¹] and 5.3(1.85) litres (70 ml kg⁻¹) respectively. Kabaddi is an intermittent sport. The rest pause during the game is sufficient for recovery. During raiding the main source of energy is anaerobic.

**Slatar and Hammel (1995)** undertook a study to compare reaction time measures to visual stimulus and arm movement. The purpose of the study was –a) to compare reaction time measures for arm displacement and visual stimulus. b) to compare reaction time measures for selected group of physical education measures and liberal art measures. Analysis of the data revealed that only a modest relationship existed between the two reaction time existed among several group for both reaction measures.

One study by **Heller (1998)** looked at the physiological profiles of male and female taekwondo black belts. It concluded that physiological and kinanthropometric parameters do not, in general, correlate strongly with taekwondo performance. The results suggest that, even in this group of relatively homogeneously trained male and female competitors, a multi factorial approach may be helpful in selecting or differentiating more and less successful competitors. The successful taekwondo competitors tended to demonstrate low body fat percentage, high anaerobic abilities, elevated aerobic fitness, strength,
and flexibility. Pulmonary function variables and height of vertical jump appear to be of little importance.

A study of Asian gold medalist Kabaddi players (N-45) for linear body measurements, circumference, and skin folds was conducted by Kaur, R., Kaur, G., Deepak, Singh, J. and Singh, S. (2001). Kabaddi players are 175.26 cm tall with 76.67 kg mean weight. They have also developed Bones and muscles (Bone mass was 11.87 kg and muscle mean was 34.39 kg) but with 17.14% body fat players are towards higher side. Somatotype of these players was found to be 2.67-5 and 46-1.94.

Olufeyi A. Adegoke and O. Arogundade (2002) the present study was carried out to investigate and establish any relationship between chronic exercise and lung function as well as basal oxygen consumption rate in a Nigerian setting. This was done by determining some lung volumes and capacities (tidal volume, TV, forced vital capacity, FVC, and forced expiratory volume in the first second FEV1%) and basal metabolic rate (BMR) in athletes and non-athletes. A total of 45 students from the University of Lagos were studied. 20 were athletes who had exercised daily in the past 2-3 years, and the remaining 25 were non-exercising non-athletes who served as controls. The subjects were divided into male and female groups. Results from the study showed that TV and FVC, but not FEV were significantly higher in male athletes than in male non-athletes. TV, FVC and FEV were not significantly different in
the two female groups. BMR was not found to be significantly different in athletes and their non-exercising counterparts in both sexes. These results suggest that the respiratory functional capacity of athletes in Nigeria could be generally superior to that of non-athletes as a result of increased development of respiratory musculature incidental to the physical training whose intensity is a strong determining factor. The enhanced respiratory functional capacity however does not lead to an enhancement of their basal metabolic functions.

Jelicic, M., Sekulic, D. and Marinovic, M., (2002) the purpose of the research was to assess anthropometric status of European high-level junior basketball players and to determine anthropometric differences between the players playing in different game positions (guards, forwards, centers). The sample consisted of 132 young basketball players, participants of the European Junior Basketball Championship, Zadar, 2000. Participants were measured with 31 measures (anthropometric variables), on the basis of which two body composition measures (BMI and relative body fat) and somatotype were calculated. The basic statistical parameters were computed. The analysis of variance and discriminant canonical analysis were employed to determine the differences between positions in play. Results indicate that prominent longitudinal and transversal skeletal dimensions as well as circumference measures characterize players on the position of centers, but they do not have significantly larger skinfold measures
in relation to forwards. Centers are also predominantly
ectomorphic compared with other players. Guards achieved
significantly lower values in all spaces and they are
predominantly mesomorphic. The results also shows that
when centers were compared with centers, guards with
guards and forwards with forwards there were insignificant
differences for their body mass index. Further investigations
are necessary in order to assess potential changes in status
of these parameters when the participants will reach the age
of senior players and afterwards, as well as to determine
relations between anthropometric status and skill related
variables.

Chauhan (2004) the purpose of the study was to
develop the regression equation for the prediction
performance of University Throwers in relation to their
anthropometric measurements. To achieve the objectives of
the study, thirty throwers were selected as subjects from the
University Athletic meet of Kurukshetra University,
Kurukshetra. Thirty two body measurements were taken
with the help of anthropometric rod, steel tape, Vernier
caliper and skin fold caliper. The throwing performance of
the subjects was measured in terms of performance in
putting the shot. Product moment method for inter
correlation and wnerry do little method for calculating
multiple correlation development of regression equation for
the prediction of performance were applied. The linear
measurements i.e. height, leg length, for length, total arm
length, upper and fore arm length, circumference i.e.
shoulder, chest, abdomen, hip and arm, body diameters i.e. biacromial, bicristal and elbow diameters, and skin fold measurements i.e. biceps, sub – scapular, supra-iliac and skin fold have been found to possess positive and significant correlation with throwing performance at 1% and 5% levels respectively. Among body composition variables i.e. fat percentage, fat weight and lean body mass have positive and significant correlations, but body density has negative and significant correlation with throwing performance at 5% level. The multiple correlation of body weight, height and total arm length with throwing performance is positive and highly significant (R=.935). The size of the multiple correlation is quite sufficient and hence, the regression equation developed can be used for the prediction of throwing performance of the athletes

Kippelen (2005) had conducted a study to evaluate the prevalence of physician diagnosed asthma and exercise induced bronchoconstriction in moderately endurance-trained athletes. Ninety five Mediterranean amateur endurance-trained athletes filled out a questionnaire about respiratory disorders and underwent a resting Spiro meter. Mean training volume was 10h per week. The prevalence of asthma was found to be 42 %. All the athletes with asthma plus another one (5.3 %) reported having exercised induced bronchoconstriction. These percentages are in the same range as those from the general population and much lower than those observed in elite athletes amateur endurance trained athletes seem not exposed to a higher risk asthma
or exercise induced broncho constriction than the general population. They suggested that 10h / week of moderate endurance training in a temperature climate area does not lend to respiratory disease.

Bayios I.A, Bergeles N.K, Apostolidis N.G, Noutsos K.S, Koskolou M.D. (2006) conducted a study on Anthropometric, body composition and somatotype differences of Greek elite female basketball, volleyball and handball players. The aims of the present study were to determine the anthropometric profile, body composition and somatotype of elite Greek female basketball (B), volleyball (V) and handball (H) players, to compare the mean scores among sports and to detect possible differences 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. Results showed that the V athletes were the tallest (P<0.001) among the three groups of athletes, had the lowest values of body fat (P<0.001) and their somatotype was characterized as balanced endomorph (3.4-2.7-2.9). B athletes were taller (P<0.01) and leaner (P<0.001) than H players, with a somatotype characterized as mesomorph-endomorph (3.7-3.2-2.4). H athletes were the shortest of all (P<0.01), had the highest percentage of body fat (P<0.001) and their somatotype was mesomorph-endomorph (4.2-4.7-
In comparison with their A2 counterparts the A1 division players were taller (P<0.001) and heavier (P<0.01), but at the same time leaner (P<0.001), and exhibited higher homogeneity in somatotype characteristics (P<0.05). Conclusion were that Anthropometric, body composition and somatotype variables 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. More data are certainly needed to define the anthropometric profile of B, V and H female athletes internationally.

**Brian A. Irving, Christopher K. Davis, David W. Brock, (2008)** Effect of Exercise Training Intensity on Abdominal Visceral Fat and Body Composition

The metabolic syndrome is a complex clustering of metabolic defects associated with physical inactivity, abdominal adiposity, and aging. To examine the effects of exercise training intensity on abdominal visceral fat (AVF) and body composition in obese women with the metabolic syndrome. Twenty-seven middle-aged obese women (mean ± SD; age = 51 ± 9yr and body mass index = 34 ± 6 kg·m⁻²) with the metabolic syndrome completed one of three 16-wk aerobic exercise interventions: (i) no-exercise training (Control): seven participants maintained their existing levels of physical activity; (ii) low-intensity exercise training (LIET): 11 participants exercised 5 d·wk⁻¹ at an intensity ≤ lactate threshold (LT); and (iii) high-intensity exercise training (HIET): nine participants exercised 3 d·wk⁻¹ at an intensity >
Exercise time was adjusted to maintain caloric expenditure (400 kcal per session). Single-slice computed tomography scans obtained at the L4-L5 disc space and mid-thigh were used to determine abdominal fat and thigh muscle cross-sectional areas. Percent body fat was assessed by air displacement plethysmography. HIET significantly reduced total abdominal fat ($P < 0.001$), abdominal subcutaneous fat ($P = 0.034$), and AVF ($P = 0.010$). There were no significant changes observed in any of these parameters within the Control or the LIET conditions. The present data indicate that body composition changes are affected by the intensity of exercise training with HIET more effectively for reducing total abdominal fat, subcutaneous abdominal fat, and AVF in obese women with the metabolic syndrome.

Castagna C., Chaouachi A., Rampinini E., Chamari K., Impellizzeri F. (2009) the aim of this study was to examine the aerobic fitness and lower-limbs explosive-power abilities of Italian regional-level amateur basketball players. Participants were basketball players playing successfully at a senior (S, $n = 11$) and junior (J, $n = 11$) regional level. Players maximal oxygen uptake ($V_{O2\text{max}}$) was assessed with them wearing a portable gas analyzer (K4b, COSMED, Rome, Italy) during an exercise mode-specific multistage fitness test (yo-yo endurance test [Yo-Yo]). Knee extensors and plantar flexors explosive power was assessed with countermovement jump (CMJ) and stiff-leg jumps (SL), respectively. Jumps were performed using a switch mat.
connected to a computer (Muscle Lab, Bosco System, Rome, Italy). Jumps' fly (FT) and contact times (CT) were used for jump performances calculations. Stiff-Leg FT versus CT ratio (SL/CT) was considered as representative of lower-leg explosive power, whereas SL/CMJ.100 was considered as sign of the explosive-power balance between lower and upper leg muscles. Players' VO2max was 60.88 +/- 6.26 and 50.33 +/- 3.98 mLxkgxmin for J and S, respectively (p < 0.05). A significant difference was found in SL/CT between S and J players. Yo-Yo performance was not significantly different between groups (2,055 +/- 267 and 2,020 +/- 174 m for S and J, respectively, p > 0.05). Lower-leg explosive power showed to be positively related to distance covered during Yo-Yo. Study results showed that 50 mLxkgxmin is a sufficient VO2max value for competing at a regional level. Calf explosive power should be considered to improve sport-specific running performance in basketball using plyometrics and whole body lifts.

**Vishaw Gaurav, Mandeep Singh and Sukhdev Singh, (2010)** the purpose of the study was to compare the anthropometric characteristics and somatotype of the Guru Nanak Dev University, Amritsar’s male basketball players and volleyball players. Sixty three sportspersons (volleyball=36 and basketball=27) of age group 18-25 years were selected from different colleges affiliated to Guru Nanak Dev University, Amritsar, Punjab, India. All the participants were assessed for height, weight, breadths, girths and skin fold thickness. An independent samples t-
test revealed that basketball players had significantly higher height (p<0.01), weight (p<0.01) and body surface area (p<0.01) as compared to volleyball players. The basketball players were also found to have significantly greater biceps (p<0.01) and suprailliac (p<0.01) skin fold thicknesses, calf circumference (p<0.05), percent body fat (p<0.01), total body fat (p<0.01), fat free mass (p<0.05) and endomorphic component (p<0.05) as compared to volleyball players. Volleyball players had significantly greater body density (p<0.01) as compared to basketball players. The basketball and volleyball players of this study were found to have higher percentage body fat with lower body height and body weight than their international counterparts. Further investigations are needed on the above studied variables along with fitness and physiological variables to assess relationships among them and with performances in volleyball and basketball.

Swapan K. Dey, Nabanita Kar and Parthasarthi Debray (2010) an attempt has been made to study the various anthropometric parameters, motor ability and physiological profiles of the different Indian national club footballers and also to compare the above parameters with their international counterparts. The present study was carried out on one hundred fifty (150) male Indian footballers of six different national clubs of India including three from Kolkata (East Bengal, Mohan Bagan & Mohammedan Sporting) and other three from Goanese clubs (Salgaokar, Vasco & Dempo). The players were also
sub-divided according to their specific field positions. Physical and physiological profiles including height, weight, percentage body fat (%BF), flexibility, agility, explosive power, and VO2 max were measured by standard procedures. It was noted that the mean values of age, height, weight and %BF were significantly different among footballers of different national clubs. Among the motor ability and physiological qualities only flexibility, agility and VO2max were significantly different among the footballers of different national clubs (p<0.01). It was also observed that the mean values of height, weight, vertical jump and VO2max of Indian national club players were found to be inferior to those of European, American and Australian footballers. However, the %body fat of Indian footballers according to their specific field positions was found to be comparable with their international counterparts. The defender, midfielder and striker of the present study were inferior in endurance (VO2max) as compared to their international counterparts. Genetic factors may be the cause of smaller body size of the subject of the present study as compare to their international counterparts. So, it can be concluded that the differences among the footballers of present study with their international counterparts and specific playing position is probably the cause of hereditary factors and differences in activity in the game.

The purpose of this study was to examine SEBT performance in division I, collegiate basketball athletes (men = 9, women = 7) and in a healthy nonathlete control group (men = 7, women = 9). Each participant performed the SEBT with their dominant and nondominant limbs on stable and unstable testing surfaces while reaching in the anterior, medial, and posterior directions. No significant differences resulted between the dominant and nondominant limbs (p > 0.05). Significant differences were found between the basketball and control groups in all directions (p< 0.01) and the average reach score (p< 0.01) with the control group reaching 6-7% farther than the basketball group. A significant main effect for gender (collapsed across group and limb) was present in the posterior direction (p = 0.02). The SEBT performance in the medial and posterior directions and the average score were significantly (p < 0.01) reduced during testing on the unstable surface. These results suggest that athletic status may be a factor to consider when interpreting SEBT reach performance. Future research should examine the influence of SEBT testing in other athletic populations. Further, use of an unstable surface provided a greater challenge to balance. Additional research may provide insight into the role of using an unstable surface with the SEBT as part of an injury risk assessment and its use in identifying limb differences between injured and uninjured limbs.

oxygen uptake following 2-week walk training with blood flow occlusion in athletes. Walk training with blood flow occlusion (OCC-walk) leads to muscle hypertrophy; however, cardiorespiratory endurance in response to OCC-walk is unknown. Ischemia enhances the adaptation to endurance training such as increased maximal oxygen uptake (VO2 (max)) and muscle glycogen content. Thus, we investigated the effects of an OCC-walk on cardiorespiratory endurance, anaerobic power, and muscle strength in elite athletes. College basketball players participated in walk training with (n = 7) and without (n = 5) blood flow occlusion. Five sets of a 3-min walk (4-6 km/h at 5% grade) and a 1-min rest between the walks were performed twice a day, 6 days a week for 2 weeks. Two-way ANOVA with repeated measures (groups x time) was utilized (P < 0.05). Interactions were found in VO2(max) (P = 0.011) and maximal minute ventilation (VE(max); P = 0.019). VO2(max) (11.6%) and VE(max) (10.6%) were increased following the OCC-walk. For the cardiovascular adaptations of the OCC-walk, hemodynamic parameters such as stroke volume (SV) and heart rate (HR) at rest and during OCC-walk were compared between the first and the last OCC-walk sessions. Although no change in hemodynamics was found at rest, during the last OCC-walk session SV was increased in all five sets (21.4%) and HR was decreased in the third (12.3%) and fifth (15.0%) sets. With anaerobic power an interaction was found in anaerobic capacity (P = 0.038) but not in peak power. Anaerobic capacity (2.5%) was increased following
the OCC-walk. No interaction was found in muscle strength. In conclusion, the 2-week OCC-walk significantly increases VO$_2$(max) and VE(max) in athletes. The OCC-walk training might be used in the rehabilitation for athletes who intend to maintain or improve endurance.

Montgomery, P.G., Pyne, D. B., Minahan, C.L. (2010) the purpose of this study was to characterize the physical and physiological responses during different basketball practice drills and games. Male basketball players ($n=11$; 19.1±/-2.1 y, 1.91+/0.09 m, 87.9+/-15.1 kg; mean+/-SD) completed offensive and defensive practice drills, half court 5on5 scrimmage play, and competitive games. Heart rate, VO$_2$, and triaxial accelerometer data (physical demand) were normalized for individual participation time. Data were log-transformed and differences between drills and games standardized for interpretation of magnitudes and reported with the effect size (ES) statistic. There was no substantial difference in the physical or physiological variables between offensive and defensive drills; physical load (9.5%; 90% confidence limits+/-45); mean heart rate (-2.4%; +/-4.2); peak heart rate (-0.9%; +/-3.4); and VO$_2$ (-5.7%; +/-9.1). Physical load was moderately greater in game play compared with a 5on5 scrimmage (85.2%; +/-40.5); with a higher mean heart rate (12.4%; +/-5.4). The oxygen demand for live play was substantially larger than 5on5 (30.6%; +/-15.6). Defensive and offensive drills during basketball practice have similar physiological responses and physical demand. Live play is
substantially more demanding than a 5on5 scrimmage in both physical and physiological attributes. Accelerometers and predicted oxygen cost from heart rate monitoring systems are useful for differentiating the practice and competition demands of basketball.

**Lidor R., Ziv G. (2010)** the main objective of this article was to review a series of studies (n = 31) on physical attributes, physiological attributes, and on-court performances of female volleyball players. Empirical and practical knowledge emerging from studies on training-related issues in volleyball, such as body mass, fat-free mass, aerobic profile, strength, and agility and speed, should be integrated and applied when planning annual training programs for volleyball players. Based on our review, it was found that (a) players of a higher skill level are taller, somewhat heavier, and have higher vertical jump values than players of a lower level; (b) the aerobic profile of female volleyball players is similar to that of female basketball players; (c) ballistic resistance training can increase vertical jump values in female volleyball players; and (d) preseason conditioning should be conducted to prevent fatigue and reduced performance at the beginning of the season. Among the research concerns discussed in the article are that there is a lack data for on-court performance and time-motion analysis in female volleyball players and those more experimental/manipulative studies are needed to examine the effectiveness of different training programs on physiological attributes of female volleyball players. Two
practical implications are suggested for volleyball and strength and conditioning coaches: (a) functional and nonfunctional overreaching should be carefully monitored when planning strength and conditioning programs, and (b) volleyball programs should include ballistic-type training.

Croft L, Dybrus S, Lenton J, Goosey-Tolfrey V (2010) to examine the physiological profiles of wheelchair basketball and tennis and specifically to: (a) identify if there are differences in the physiological profiles of wheelchair basketball and tennis players of a similar playing standard, (b) to determine whether the competitive physiological demands of these sports differed (c) and to explore the relationship between the blood lactate [Bla-] response to exercise and to identify the sport specific heart rate (HR) training zones. Six elite athletes (4 male, 2 female) from each sport performed a submaximal and VO2peak test in their sport specific wheelchair. Heart rate, VO2, and [Bla-] were measured. Heart rate was monitored during international competitions and VO2 was calculated from this using linear regression equations. Individual HR training zones were identified from the [Bla-] profile and time spent within these zones was calculated for each match. Despite no differences in the laboratory assessment of HR peak, the VO2peak was higher for the basketball players when compared with the tennis players (2.98 ± 0.91 vs 2.06 ± 0.71; P = .08). Average match HR (163 ± 11 vs 146 ± 16 beats x min(-1); P = .06) and average VO2 (2.26 ± 0.06 vs 1.36 ± 0.42 L x min(-1); P = .02) were higher during
actual playing time of basketball when compared with whole tennis play. Consequently, differences in the time spent in the different training zones within and between the two sports existed (P < .05). Wheelchair basketball requires predominately high-intensity training, whereas tennis training requires training across the exercise intensity spectrum.

Carbuhn AF, Fernandez TE, Bragg AF, Green JS, Crouse SF (2010) this is a novel descriptive study to characterize off-season, preseason, and postseason bone and body composition measures in women collegiate athletes. From 2006 through 2008, 67 women collegiate athletes from 5 sports, softball (n = 17), basketball (n = 10), volleyball (n = 7), swimming (n = 16), and track jumpers and sprinters (n = 17) were scanned using dual energy X-ray absorptiometry (DXA) at 3 seasonal periods: (a) off-season = before preseason training, (b) preseason = after preseason training, and (c) postseason = after competitive season. Dual energy X-ray absorptiometry scans were analyzed for total body mass, lean mass (LM), fat mass (FM), percent body fat (%BF), bone mineral content, bone mineral density (BMD), arm BMD, leg BMD, pelvis BMD, and spine BMD. Data were analyzed between sports using analysis of variance (ANOVA) with Tukey post hoc follow-ups, and within each sport using repeated-measures ANOVA and LSD; alpha < 0.05. Significant off-season to preseason or postseason changes in %BF, LM, and BMD within each sport were as follows, respectively: softball, -7, +4, +1%; basketball, -11, +4, +1%;
volleyball, unchanged, unchanged, +2%; swimming, unchanged, +2.5%, unchanged; track jumpers and sprinters, -7, +3.5, +1%. Comparisons among athletes in each sport showed bone measurements of swimmers averaged 4-19% lower than that of athletes in any other sport, whereas for track jumpers and sprinters, %BF and FM averaged 36 and 43% lower compared with other sports at all seasonal periods. Values for athletes playing basketball and volleyball were most similar, whereas softball athletes' values fell between all other athletes. These data serve as sport-specific reference values for comparisons at in-season and off-season training periods among women collegiate athletes in various sports.

Ben Abdelkrim N, Castagna C, Jabri I, Battikh T, El Fazaa S, El Ati J. (2010) conducted a study on activity profile and physiological requirements of junior elite basketball players in relation to aerobic-anaerobic fitness. The aim of this research was to examine the demands of competitive basketball games and to study the relationship between athletes' physical capability and game performance. Physical and physiological game demands and the association of relevant field test with game performance were examined in 18 male junior basketball players. Computerized time-motion analysis, heart rate (HR), and blood-lactate concentration [BL] measurements were performed during 6 basketball games. Players were also measured for explosive power, speed, agility, and maximal-strength and endurance performance. During the games,
players covered 7,558 +/- 575 m, of which 1,743 +/- 317; 1,619 +/- 280; and 2,477 +/- 339 m were performed at high, moderate, and low intensities, respectively. The 19.3 +/- 3.5 and 56.0 +/- 6.3% of the playing time was spent above 95% and at 85-95% of maximal HR, respectively. Average and mean peak [BL] were 5.75 +/- 1.25 and 6.22 +/- 1.34 mmolxL, respectively. Distances covered at maximal- and high-speed running significantly (p < 0.01) decreased during the second half. Game maximal- and high-speed running were significantly correlated with endurance performance (r = 0.52, p < 0.05 and r = 0.49, p < 0.05, respectively). High-intensity shuffling distance resulted in being negatively related with agility (r = -0.68, p < 0.05). This study showed that basketball players experience fatigue as game time progresses and suggests the potential benefit of aerobic and agility conditioning in junior basketball.

Nandalal Singh and Jasveer Kaur (2011) the purpose of the study was to compare the lung capacity and body mass index between female physical education and non-physical education students. To achieve the objective of the study, twenty five female physical education students and twenty five female non-physical education students were selected randomly as subjects. The age of the subjects ranged between 20 to 26 years. To determine the significant difference between the mean scores of female physical education and non-physical education students on lung capacity and body mass index (BMI),'t’ test was employed
with the help of SPSS software. The level of significance was set at 0.05. There was significant difference obtained on lung capacity between female physical education and non-physical education students. There were no significant differences obtained on body mass index (BMI) between female physical education and non-physical education students. The finding reveals that female physical education students have significantly better in lung capacity as compare to female non-physical education students.

Sukhdev Singh, Vishaw Gaurav and Keshav Kohli (2012) the purpose of present study was to compare the peak flow rate and vital capacity between district level and state level baseball players. The subjects consist of 30 (District level: 15 and State level: 15) randomly selected male baseball players, between the age group of 18 to 28 years, studying at different colleges affiliated to Guru Nanak Dev University, Amritsar, Punjab, India. It was hypothesized that there may be significant differences with regard to peak flow rate and vital capacity between district level and state level baseball players. Peak flow rate was measured with a peak flow meter. Vital capacity was measured by spirometer. The between-group differences were assessed by using t-test. The level of p<0.05 was considered significant. The t-test revealed that state level baseball players had significantly higher peak flow rate and vital capacity (p<0.05) than district level baseball players. Further investigations are needed on the above studied variables.
along with motor fitness variables to assess relationships among them and with performances in baseball.

Archana Chahal, Sushma Ghildyal, Vijay Chahal (2012) Talent identification, selection, training and improvement (TISTI) programs were scanty in team sports especially in consideration of Indian female Basketball. This study tested the hypothesis that predicting excellence in junior Indian female basketball players in relation to anthropometric, physiological variables and then helpful to determine the squads of other levels. The regression and factorial analysis to predict the excellence were applied. The study measured anthropometric measures (height, weight, arm length, palm length, leg length and the girths of the upper arm, wrist, thigh and calf) and physiological variables (anaerobic power, peak flow rate, vital capacity and four skin folds for body fat percentage) of ninety six female players competing at junior National Basketball championship. To collect the data of selected variables were taken on each subject individually during rest hours with the help of standard scientific instruments and techniques. Significant relationships were found between performance in relation to palm length (0.32), leg length (0.29), upper arm circumference (0.24), anaerobic power (0.30), peak flow rate (0.69), vital capacity (0.22) and body fat percentage (0.37). The performance in junior female basketball players could be attributed to selected anthropometrical and physiological variables followed by prediction equation. Factor analysis of data showed four prominent factors.
Application of the findings may prove more beneficial and effective TISTI program to optimize playing ability at appropriate chronological and competitive age (peak performance age).

### 2.3 PHYSIOLOGICAL VARIABLE

**Beise (1937)** Virginia pearly of university of Michigan took up a study of relation of reaction time speed and agility of the big muscles group to certain sports skill. Three groups were selected 1st was selected on the basis of demonstrated skill either tennis, golf or archery 24 players were selected, 2nd was selected in physical activities (those who failed to achieve average skills 14 subjects), 3rd was selected on those student who scored very low scores in Braces motor test. The group consisted of 6 low groups and 8 high groups, test was applied. Result: These were significant difference in the result of skilled and non-skilled players.

**Atwell and Elbel (1948)** studied the voluntary or involuntary response of individuals to stimuli under various conditions. The study was conducted in an attempt to determine whether a significant difference in simple reaction time exists between age groups of male high school students. In this study 247 male high school students ranging in age from 14 to 17 years were used as subjects. They were divided into their respective age groups and tested individually by the same tests for speed of hand and body movement in response to stimulus. The data were
presented in terms of mean scores for age group based upon 7 trials for each subject for hand response. The coefficients of correlation between hand and body response for each group were also calculated. It is seen that for the hand response, there is a more rapid responses with each successive age group. Also there is variation in response with increase in age.

Espenschade and Dable (1953) conducted two studies of dynamic balance in adolescent boys. It was found that dynamic balance is not related to height or weight but correlates substantially with the physical abilities important in physical education program.

Mohr, Dorothey, R. and Haverstic, Mrtha, J. (1956) studied 102 women students at the University of Maryland enrolled in eight week volleyball courses who were given repeated volleys test at 3ft. and 7ft., restraining lines. This height was measured and they were given tests for agility and vertical jumping. Correlations were computed between volley test and other factors. From a study of these correlations and the significance relationship was found between jumping and volleys at the 3ft. distance.

Lotter (1960) Investigated to determine the inter relationship among reaction time and speed of movement in different limbs. Two-movement basic to sports skills, modified baseball throws and football kicks were studied in 105 college athletes of various activities. This was only a moderately high correlation between the reaction time
ability of right and left legs and between right and left arms. Arm verses legs correlation was significant but low. A similar pattern of correlation between limbs was found for movement specificity was high. The reliability of individual difference was high in all the measures.

Jennet (1960) found that performance or agility tests were accounted for in part by reaction time, speed of movement, strength, balance, change of position, change of direction, and body size and from. A significant difference was found between several mean factors scores of the athlete and non-athlete groups but no significant differences was found between the mean factor scores for the various groups of athletes.

Clair (1960) divided male students in 2 groups of 50 each athletes and non-athletes. The athletes consisted of 10 each basketball, gymnastic baseball, football players, lines men and football back 25 tests were administered to each subjects. The findings indicated that performance and agility test were accounted for the part, by reaction time, speed or movement, strength balance, change of direction and body size and from a significant difference was found between the mean scores of the various group of athletes.

Hodgkins (1963) carried out a study on reaction time and speed of movement in males and females of various ages 930 men, women and children ranging in ages in their speed of reaction and movement time. The study revealed that a) males are faster than females both in reaction time
and movement, b) speed of both functions increase up to early adulthood and then decreases, c) peak speed is maintained longer by males in movement and by females in reaction time, and d) in majority of groups studies no relation existed between speed of movement and speed of reaction.

**Kerr (1966)** tested 47 male college students for speed of reaction time movement in a knee extension movement of 680. Each subject took 20 trials, the last 15 being only used for the analysis presented in this study. One week later 39 of the same parameters. In both tests reaction time was found to correlate with speed of movement ($r=0.538$ and $0.629$). The two correlation coefficients were not found to be significantly different from each other.

**Panhonin (1967)** selected 33 college women randomly from level beginning classes who were tested in agility, balance, eye hand coordination, grip strength, height and arm and shoulder strength. The criterion of tennis ability was the combined ‘t’ score from the Dyer Test, Broer and Miller Forehand-Backhand test and skill rating by three judges. The most economical predictor of tennis ability balance and arm-shoulder grip strength for a ‘r’ of 62. Adding right hand grip strength improved the ‘r’ slightly although the correlations of grip strength and eye-hand coordination with tennis ability were not significant.

**Mulmisur (1967)** investigated selected physical characteristic of junior Davis cup players and their relation
to success in tennis agility, arm-shoulder coordination, pure speed, depth perception, reaction time, movement time, dynamic balance. All rebounding, weight and height showed no significant correlation with success in tennis for this group.

Fifty Male subjects’ ages thirteen and fourteen were tested by Carlyle (1969) on their ability to balance on a stationary base and on a moving base. For each subject scores were recorded for each of 3 trials on each test. Analysis of the data revealed that for each test the gain between the trials 1 and 3 was significant. There’s computed for all possible combinations of scores indicated that there was a marked relationship balance on a stationary base and balance on a moving base.

Burke, Thomas Richard (1972) examined the effect of stimulus condition and direction on reaction time and movement time of closed and open skill athletes. The stimulus conditions were simple as well as complex. The direction of movement were to the front, the left, the right and to the near. 42 closed athletes were gymnasts, cross country runners and swimmers, while the 42 open athletes were soccer, baseball and basketball players. A significant interaction was achieved, between the stimulus condition and direction. The following conclusions were made.

1. Reaction time and movement time measures were faster under complex stimulus conditions.
2. The open skill athletes had faster reaction time movement time measures than the closed skill athletes.

**Farrow (1975)** investigated motor performance variables for a sample population of professional baseball player, eight motor performance variables were selected as valid measure of components of professional baseball playing ability were defined as (1) running speed, (2) muscular power, (3) depth perception, (4) shoulder flexion strength, (5) throwing speed, (6) agility, (7) eye hand coordination, and (8) reaction time.

In addition the athletic motivational inventory which measures 13 personality traits were administered to each subject. 103 professional baseball players who trained in Florida during 1974 baseball season were selected as subjects. Statistical procedures used for analyzing the data were percentile rank, one way analysis of variance. It was concluded that test battery of vertical jump, eye hand coordinations, Illinois’s agility run, shoulder flexion strength, glace and bat tests, medicine ball put, 60 yard dash and throwing speed successfully differentiate between players classified on low minor leagues and those who are either high minor or overage league players, with significant difference in performance favoring the late two group.

**Puhl, Jacqueline (1982)** conducted a study to examine the absolute and relative physical and psychological characteristics of elite men and women
volleyball players. They tested eight members of U.S. men national team and 14 members of women university world game volleyball team. The parameters measured indicated present body fat, VO2 max, post exercise blood lactic acid measures of vertical jumping ability and peak isokinetic torque for knee flexion and extension, shoulder extension and planter flexion at 80, 180, 240 and 300 degrees per second. And they established following findings (1) As expected the men were taller, heavier has a higher body density and lean body weight and lower body fat, (2) For gross measures of jumping ability the men achieved greater jump distance above the standing bench.

**Dixit, Poonam (1982)** investigated that interrelation of reaction time, speed of movements and agility and their comparison among players from selected sports. She studied 48 male college students i.e. 12 subjects from each selected sports (football, volleyball, kho-kho and kabaddi) from Lakshmibai National College of Physical Education, Gwalior). She found that agility and speed of movement were significantly related with either the speed on management on agility at 0.05 level of confidence.

**Lynch (1985)** conducted a study on muscular power, reaction time and visual perception as related to striking abilities of second grade children. The purpose of the study was to determine if significant difference existed in the performance of various physical and perceptual variables. In addition, an attempt was made to predict striking ability
and to determine whether significant differences existed in the performances of males and females on selected variables tested. The study utilized female and male second grade children who were studying in the Fayettville Arbanas School for the spring semester of 1983. Ninety subjects completed all testing procedure. An independent ‘t’-test was computed along with Pearson’s Product Moment Correlation stepwise multiple regression was utilized for the prediction of striking ability. Mean for each variable were computed for female and male groups as each variable.

**Steizer (1989)** assessed reaction time, speed, agility and sergeant jump among different levels of handball players. One hundred and ninety six school and college male players were selected. When t test was applied it was found that both groups were significant different for reaction time, speed, agility and sergeant jump.

**Mark Brooks, Larry Boleach (1989)** to determine the predictive potential of selected psychomotor variables to estimate basketball performance. Thirty six male high school players from three schools in the same conference were evaluated using the four psychomotor variables i.e. agility, differentiation ability, orientation ability and reaction ability. It was found these teams had different psychomotor abilities. Hence, they had significant differences.

**Boutellier U., Baechel R., Kudent A. & Piwko R. (1992)** found that respiratory training actually enhanced exercise tolerance. In another study Boutellier on trained
aerobic athletics using a respiratory resistance device different from the Power lung, the researchers found no significant increases in either VO2max or LT during a cycle ergo meter test. However they did see an increase of submaximal cycling time. Like Boutellier’s group, they didn’t see an increase in VO2max or VT. The subjects that were tested in this study were highly trained aerobic athletes. Significant changes in VO2max with high caliber aerobic athletes are rarely seen in short durations, and are usually a function of high levels of aerobic training over a long period of time. For this reason no changes were expected in VO2max during a four week study. The increased strength of the respiratory muscles allowed the subjects to perform more work (i.e. move more air) while breathing fewer times.

**McArdle W. J., Katch F.I., Katch V.L. (1996)** it is recognized that the respiratory muscles will adapt to aerobic training. Most aerobic athletes have very well trained respiratory muscles from their sport alone. During competition athletes will take thousands of breaths. Like all other skeletal muscles the pulmonary muscles when engaging in aerobic metabolism require oxygen. The fatigue resistance of this process is related to the training status of the muscle. If the muscle is more endurance, trained, then it will be less likely to constrain ventilation and exercise performance.

**Cavas, L. and Daglioglu, O. (1998),** studied the voluntary or involuntary response of individuals to stimuli
under various conditions. The study was conducted in an attempt to determine whether a significant difference in simple reaction time exists between age groups of male high school students. In this study 247 male high school students ranging in age from 14 to 17 years were used as subjects. They were divided into their respective age groups and tested individually by the same tests for speed of hand and body movement in response to stimulus. The data were presented in terms of mean scores for age group based upon 7 trials for each subject for hand response. The coefficients of correlation between hand and body response for each group were also calculated. It is seen that for the hand response, there is a more rapid responses with each successive age group. Also there is variation in response with increase in age.

The twelve members of USA Olympic women’s field hockey team those were going to participate in Atlanta Olympics 1996 were studied by Sparling, P.B., Snow, T.K., Rosskopf, L.B., O’ Donnel, E.E., Freedson, P.S., Byrnes, W.C. (1998). The players studies were having age 27 years height 165 cm and weight 59.6 kg, the mean bone mineral density value of the members of the 1996 United States Olympic women’s field hockey team is 1.25 kg/cm^2, which is very high. The mean fat free mass per unit height was quite high and percentage fat was low. It is found that in this group of World class sportswomen, low percent fat was not associated with low bone mineral density, mean body mass index of the team is 22.0+ 1.3kg/cm.
Susana Mota (1999) he has reported that in trained athletes, maximal exercise by ventilations is believed to be constrained by expiratory flow limitations (FL). When doing further research with highly trained athletes one might also consider trying different protocols. In all forms of resistance training, not only is the intensity increased, but the all over volume and duration is also varied.

Dempsey and Wagner (1999) 50% of highly trained male athletes and greater number of female athletes develop exercise induced arterial hypoxemia during maximal exercise. These athletes unable to maintain arterial oxygen saturation (SaO2) show decreases the indicators of endurance. Performance and a reduced maximal aerobic capacity. These observations have fuelled research over the last two decades to investigate the possible mechanics, which include intra pulmonary shunting of blood, relative alveolar hypoventilation, ventilation perfusion inequality and pulmonary diffusion limitations. These mechanics have attracted great deal of attention but the underlying causes of EIAH have yet to be completely understood.

Ray (2001) a study was undertaken to observe any beneficial effect of yogic practices during training period on the young trainees. 54 trainees of 20-25 years age group were divided randomly in two groups i.e. yoga and control group. Yoga group (23 males and 5 females) was administered yogic practices for the first five months of the course while control group (21 males and 5 females) did not
perform yogic exercises during this period. From the 6th to 10th month of training both the groups performed the yogic practices. Physiological parameters like heart rate, blood pressure, oral temperature, skin temperature in resting condition, responses to maximal and submaximal exercise, body flexibility were recorded. Psychological parameters like personality, learning, arithmetic and psychomotor ability, mental wellbeing was also recorded. Various parameters were taken before and during the 5th and 10th month of training period. Initially there was relatively higher sympathetic activity in both the groups due to the new work/training environment but gradually it subsided. Later on at the 5th and 10th month, yoga group had relatively lower sympathetic activity than the control group. There was improvement in performance at submaximal level of exercise and in anaerobic threshold in the yoga group. Shoulder, hip, trunk and neck flexibility improved in the yoga group. There was improvement in various psychological parameters like reduction in anxiety and depression and a better mental function after yogic practices.

**Julian Espartero (2003)** the purpose of the study was on Physical activity, physiological, and psychomotor performance: a study of variously active older adult men. This research examined varying levels of physical activity and psychomotor and physiological function in variously active older men. Very active, moderately active, and low active participants were tested on simple (SRT) and choice
reaction time (CRT), coincidence-anticipation timing (CAT), and \([\text{VO}.\text{sub.2}]\text{max}\). No significant differences for age or height were found, although percentage of fat, and weight were statistically different. Active groups were leaner and lighter. \([\text{VO}.\text{sub.2}]\text{max}\) was significantly different between groups, as physically active groups yielded greater values. SRT and CAT also yielded significantly different results with more active participants showing better performance. No between-groups significant differences resulted for CRT. Generally, increased levels of physical activity were related to superior physiological outcomes and improved psychomotor performance.

Daniel Rodenstein, Eduardo Banacalari, Robert A. Brown, Jack L., Clausen (2003) he has reported that young swimmers have longer lung volumes and a great cardio respiratory functional capacity than other children.

Metaxas, T.I., Koutlianos, N., Sendelides, T., and Mandroukas, A.(2009) the purpose of this study was to examine and compare the cardiorespiratory performance and isokinetic muscle strength between Greek soccer and basketball players of different divisions before starting the training season. Study participants included 100 soccer players and 61 basketball players, who were assigned according to the kind of sport and division. All participants underwent anthropometric measurements and performed an exercise test on a treadmill to determine maximal oxygen uptake \((V_{\text{o2}}\text{max})\). Peak torque for quadriceps and
hamstring muscles was measured on isokinetic dynamometer at angular velocity of 60 degrees/s⁻¹, 180 degrees/s⁻¹, and 300 degrees/s⁻¹. The statistical $p$ value was set at $p<0.05$. In soccer players $V\overline{o}_2\text{max}$ in absolute and relative values was significantly lower in division IV compared to the other 3 divisions (3,413.4 ± 351.0 vs. 3,932.7 ± 551.2, 4,172.7 ± 371.8, 4,223.0 ± 323.8 ml·min⁻¹, respectively; $p<0.001$ and 46.93 ± 4.20 vs. 52.47 ± 3.66, 54.86 ± 3.80, 55.32 ± 3.33 ml·kg·min⁻¹, respectively; $p<0.001$). Basketball players presented significantly higher $V\overline{o}_2\text{max}$, in absolute values, compared to soccer players for divisions II (4,586.3 ± 586.3 vs. 4,172.7 ± 371.8 ml·min⁻¹; $p<0.05$), III (4,319.6 ± 418.6 vs. 3,932.7 ± 551.2 ml·min⁻¹; $p<0.01$), and IV (4,624.0 ± 627.6 vs. 3,413.4 ± 351.0 ml·min⁻¹; $p<0.001$), respectively. Regarding peak torque, only basketball players showed significantly higher values at 60 degrees/sec⁻¹ in hamstrings for III ($p<0.05$) and IV division ($p<0.05$). Conclusively, the higher $V\overline{o}_2\text{max}$ reached by professional soccer and basketball players compared to semiprofessional and amateur ones and between the soccer and basketball players of the same division can be attributed to the different duration of the maintenance period and to the effect of the training session on each sport, respectively. Finally, a higher level of muscle strength would be preferable in soccer and basketball and would reduce the risk for injuries in the maintenance and rebuilding training periods.
Delextrat A., Cohen D. (2009) The aim of the present study was to investigate the effect of playing position on strength, power, speed, and agility performances of women basketball players. Thirty subjects playing at national level participated in this study. They were divided into 3 groups according to playing position: guards (positions 1 and 2), forwards (positions 3 and 4), and centers (position 5). Each subject performed 8 tests presented in a random order: The 30-second Wingate Anaerobic test (WAnT), isokinetic testing of the knee extensors, 2 types of jump tests, a 20-m sprint, the agility T-test, a suicide run, and a basketball chest pass. Statistical differences between playing positions were assessed using a 1-way analysis of variance (ANOVA) and Scheffe post hoc analyses. Results showed that guards performed significantly better than centers for the relative peak and mean power achieved during the WAnT (+13% and +16.9%, respectively), relative peak torque of knee extensors (+19.5%), single-leg jump (+21.8), suicide run (+7.5%), and agility T-test (+6.4%, p < 0.05). In addition, guards achieved significantly better performances than forwards in the suicide run test (+7.1%) and forwards were characterized by a greater peak torque of the knee extensors compared to centers (+22.1%). These results indicate that specific fitness training must be undertaken according to playing position. The ability to perform the suicide run, the single-leg jump, and the different movements involved in the agility T-test must be developed in guards. In contrast, speed over short
distances and strength development of lower body and upper body should be performed by all playing positions.

**Karkare Ajay (2011)** Anthropometric measurements and body composition of hockey players with respect to their playing positions, the objective of the present study was to compare anthropometric measurements and body composition of hockey players with respect to their playing position. Two hundred and ten junior national hockey players seventy each from half line, back line and forward line was selected different state of India. Anthropometric measurements including height, weight, diameter, breadth, girth and skin fold thickness was taken from entire subjects. Body composition was measure with the help of Matiegka’s method (1921). To find out significant difference statistical method one way ANOVA was performed. Results found that, hockey players playing in different position found to be differing on some anthropometric measurements and body composition.

**Khare et. al. (2012)** the study was to find the relationship of Physical variables with the performance of Squash Racket Players. For the purpose of the study, Twenty Squash Racquet Players were selected as subject from Lakshmibai National University of Physical Education, Gwalior, Banaras Hindu University, Varanasi and from Jiwaji club, Gwalior. There are different Physical variables were selected for achieving the purpose of this study like arm strength, leg strength, agility and flexibility. For this
study the arm strength was measured by the Roger's formula, the leg strength was measured by leg dynamometer, the agility was measured by shuttle run and flexibility i.e. spine flexibility was measured by Modified sit and reach test. For shoulder-wrist flexibility, Shoulder and wrist elevation test was applied and the Squash Racquet performance was evaluated and graded by a panel of experts on the basis of their skills, techniques and match results. Zero order correlation was used to compute correlation between Squash Racquet Performance with the selected variables at 0.05 level of significance. The result of the study indicates that the shoulder - wrist flexibility and agility were found significant at 0.05 level of significance. And on the basis of the findings of the study, the following conclusion drawn that the shoulder - wrist flexibility and agility of the subjects were important variables for better performance in Squash Racquet game.

Mahendiran and Balamurugan (2012) the present study aims to investigate the alteration in sprinters temporal patterns on selected fitness components during normal and disturbed sleep state. To achieve the purpose ten (10) male sprinters were selected from the Department of Physical Education and Sports Sciences, Annamalai University. These subjects age ranged between 18 to 25 years. The ten sprinters were examined on Speed, Explosive power, Flexibility and Strength endurance on two occasions for 24 hours (00:00, 04:00, 08:00, 12:00, 16:00, 20:00 and 24:00), one during normal nocturnal sleep and the other
during disturbed nocturnal sleep. The characteristics of
temporal rhythm such as acrophase, amplitude, MESOR
and r-values of selected fitness variables were measured by
using cosinor win software. The overall mean differences
were calculated using paired sample t-test (SPSS 17
version). The result of the study showed a significant
MESOR difference on speed (p < .0001), explosive power (p <
.0001), flexibility (p < .0001) and strength endurance (p <
.0001). The rhythmometric analysis showed a significant
phase advanced in Speed 15:39 hours, Explosive power
9:56 hours, Flexibility 7:54 hours and Strength endurance
7:54 hours. It can be concluded that disturb sleep during
nocturnal can impair sprinting performance in male
sprinters. However, sprinters with good nocturnal sleep
showed better sprinting performance during daytime.
Arisen, we can explain the concept and importance of
testing, select the components that are necessary to test
and propose a valid, reliable and objective battery of tests of
assess the physical form of children.