A literature review enables a researcher to accomplish a number of more specific aims. It is likely, for example, that in the early stages of research the researcher may have only a vague idea of the area the researcher would like to explore vastly. The researcher may have only a tentative outline of the research problem. A review of the related literature will help the researcher to focus his tentative problem by both limiting and defining more clearly the topic he is interested in researching. The researcher will be aware of possible pitfalls, or search questions that have been thus far neglected reading around the subject will help the researcher to distil the issues he wish to concentrate upon and leave him with a concise, detailed and distinct plan of action.

A well-structured literature review is characterized by a logical flow of ideas; current and relevant references with consistent, appropriate referencing style; proper use of terminology; and an unbiased and comprehensive view of the previous research on the topic.

Review of related literature decides, allowing the researcher to acquaint himself with current knowledge in the field or area in which he is going to conduct his research, serves the following specific purposes.

- The review of the related literature enables the researcher to define the limits of his field. It helps the researcher to delimit and define his problem. The knowledge of related literature, brings the researcher up-to date on the work which others have done and thus to state the objectives clearly and concisely.

- By reviewing the related literature the researcher can avoid unfruitful and useless problem areas. He can select those areas in which positive findings
are very likely to results and his endeavours would be likely to add to the knowledge in a meaningful way.

- Through the review of the related literature, the researcher can avoid unintentional duplication of well-established findings. It is no use to replicate a study when the stability and validity of its results have been clearly established.

- The review of related literature gives the researcher an understanding of the research methodology, which refers to the way the study, is to be conducted. It helps the researcher to know about the tools and instrument, which proved to be useful and promising in the previous studies. The advantage of the related literature is also to provide insight into the statistical methods through which validity of results is to be established.

- The final and specific important reason for reviewing the related literature is to know about the recommendation of previous researchers listed in their studies for further research.¹

The researcher made a systematic attempt to review the related literature by keeping the aforesaid points in mind. The researcher reviewed some detailed in the following studies:

**Sandeep (2012)**² compared the study of physiological fitness of volleyball and basketball players at state level. The objectives of the study were:

1. To measure Comparative study of physiological variable; heart rate of volleyball and Basketball players. 2. To measure Comparative study of physiological variable; blood pressure of volleyball and Basketball players. A sample consisting of 100 male students were selected on the basis of stratified

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random sampling technique. The subject belonged to different districts of Uttarakhand. For measuring Physiological variables we used some tools- (a) Heart rate was measured by pulse rate test. (b) Blood pressure was measured by sphygmomanometer.

Razman et al. (2012)³ studied the anthropometric and strength characteristics of tenpin bowlers with different playing abilities. The primary purpose of this study was to investigate the strength and anthropometric characteristics of elite and semi-elite tenpin bowlers as compared to non-bowlers, and to establish whether it was possible to discriminate playing level through selected predictor variables. Elite and semi-elite bowlers were distinguished by their bowling score average (BSave), with participants scoring 200 pin falls and above assigned to the elite group. Eighteen elite bowlers (M=10, F=8; BSave 213.2±6.80), 12 semi-elite bowlers (M=7, F=5; BSave 181.3±9.36) and 33 sedentary university students (M=14, F=19) were recruited. Anthropometric measurements were taken and isometric arm strength was recorded. Between-group differences were identified through a two-way ANOVA, while discriminant analysis was used to predict group membership. For anthropometric characteristics, the results indicated that the elite bowlers were heavier, had longer lower leg and hand length and had a wider arm span as compared to the non-bowlers. The elite group also had stronger forearm/wrist internal rotation compared to non-bowlers. In addition, the male elite groups were stronger than the non-bowling group for arm flexion. There appeared to be a 54% success rate for predicting group membership from selected anthropometric and strength discriminating variables, with forearm/wrist internal rotation strength being the best discriminating variable. It is suggested that coaches should benefit by selecting larger built bowlers with long limbs.

Furthermore, bowlers could potentially gain by paying extra attention to increasing the strength levels of forearm/wrist internal rotators and arm flexors during training. These findings also provide normative data for elite and semi-elite bowlers.

Raut (2012)\(^4\) compared the relationship between skill performance and selected motor fitness variables of tribal women handball players. The present study was conducted on 30 thirty women handball players randomly selected as subject from the players undergoing training camps at Pt. Ravi Shankar University Raipur, Guru Ghasidad University Bilaspur, (C.G.). Sarguja University, Ambikapur (C.G) and S.G.B.A. University, Amravati, (MH). For East zone intervarsity handball competition, the age of the subject ranged 17 to 23 years old. Skill performance as Passing ability, Defensive ability and dribbling ability were taken as independent variables. For motor fitness variables speed, explosive power, agility, cardio-respiratory endurance flexibility were taken under consideration. Defensive ability, Passing ability and Dribbling ability was assessed by Defense movement test, passing test and controlling dribbling test. The test selected for assessing motor fitness variables were speed by 50meter run, explosive jump by sergeant jump, agility by (6x10 meter) shuttle run Cardio-respiratory endurance by 12 minute run/walk test and flexibility by sit and reach test. To find out correlation between selected motor fitness variables to skill performance of tribal handball player Pearson Product Moment Correlation method was used at .05 level of significance. The result shown that defensive ability had positive correlation with speed and agility whereas explosive power, cardio-respiratory endurance, and flexibility had a negative correlation. The passing ability had a negative correlation with speed & agility and a positive correlation with explosive power, cardio respiratory

endurance, and flexibility. The skill of dribbling had a positive correlation with speed and agility, a negative correlation with explosive power and was insignificantly correlated to cardio respiratory endurance and flexibility.

Karkare (2011)\(^5\) compared the relationship between 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 skinfold 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 differs on some anthropometric measurements and body composition.

Kalepwar (2011)\(^6\) studied of effect of general physical fitness on the sport performance of volley ball players. The objectives of the study were to measure the physical fitness level of volleyball players. To delineate the relationship between physical fitness and the sport performance of volleyball players. The study was conducted in Nanded district of Marathwada region. Ninety six (96) volley ball players who represents different volleyball tournament at college and inter college level have been selected. The components of general physical fitness finalized by the coaches incharge of Netaji Subash National Institute of Sports (NSNIS), Patiala having poor, satisfactory, good, very good and excellent grading and scoring have been


selected. The performance of volleyball players have been judge and classified. The data have been collected with the helps of well structured questionnaire by survey method. Growth and development are the manifestations of life and their rate and quality indirectly reflects the general health of an individual. Health of an individual is determined through the study of somatometric variables and body components. Many hereditary and environmental factors are responsible for influencing the health of an individual. The health, the physical endurance, the agility and tenacity are usually different.

**Jalili et al. (2011)**\(^7\) identified the study of comparison of personality dimensions, mental toughness, and social skills of female students athletes (team-individual) and non-athletes. The present study was to investigate and identify personality dimensions of individual and team athletes and to compare the level of social skills and mental toughness of individual and team athletes with non-athletes. 210 high school students of Tehran City (70 individual athletes, 70 team athletes, and 70 non-athletes) participated in the research. The participants were asked to fill out the “Social Skills” and “Mental Toughness” questionnaires as well as Eysenck Personality Scale. Various statistical indices and method were applied for data analysis including mean, standard deviation, and t-test. The results indicated that there is a significant difference between individual athletes, team athletes, and non-athletes in mental toughness, social skills, and personality dimensions. It can be concluded from the results that personality characteristics of individual and team athletes are different from non-athletes.

\(^7\) Fatemeh Jalili; Saeedeh Alsadad Hosseini; Firozeh Jalili and Mir Hamid Salehian. “Comparison of Personality Dimensions, Mental Toughness, and Social Skills of Female Students Athletes (Team-Individual) and Non-Athletes.” *Annals of Biological Research* (2011), Vol.2(6) : 554-560.
Ibrahim and Gwari (2011)\textsuperscript{8} A Study of Achievement Motivation of Low and High Level Volleyball Players. The aim of the study was to examine the relationship of Sports Achievement Motivation of volleyball players. A group of (N=50) male subjects divided into two groups (N=25 high performers) and (N=25 low performers) were selected for this study from rural games mela held at Mendhar tehsil of Jammu and Kashmir State. Their age range of the subjects was 25 to 30. It was hypothesized that there may be significant differences with regard to achievement motivation among low and high performers. The ‘t’ test was used to analyze data. The achievement motivation scale by Kamlesh (1990) was used to assess the differences among the low and high performers. The level of p<.05 was considered significant. Results indicated that significant relations were found between high/low performers. On the basis of the result of the present empirical investigation it is concluded that significant relations were found between sports achievement motivation and low and high performance of volleyball players. These results may be corroborated with the findings of Rathee and Singh (2011) they observed that the differences between the two performance levels i.e. national and international have been found to be significant. These results provided evidence that high achievement motivation is an important factor that distinguishes high level performers (Butt and Cox, 1992).

Mohamed (2010)\textsuperscript{9} studied the anthropometric measurements as a significant for choosing juniors in both volleyball and handball sports (factorial analysis study). The research aims to identify the important anthropometry measurements, which represent the basic dimensions of the body in both sports, volleyball and handball, from Egyptian juniors in the age from 15 to 18 years, by


moving from diversity and abundance which are represented in the original anthropometric included in the study to the few that are in clusters or common factors derived from the study for each sports the same search every individual and determine the number of anthropometry measurements under search-included in the analysis - to a smaller number depends on the amount of factors saturates joint derived from the analysis, which may provide researchers and trainers time and effort when trying to apply these anthropometry measurements for the selection of juniors and identifying the anthropometric factors associated with each sport, volleyball and handball, separately and the name of these factors and hypotheses of the research building factorial analysis of forty-four anthropometric measurements and identify the most important standard anthropometric factors in both volleyball and handball and find the statistical differences the function in the most important measurements anthropometric between volleyball and handball for volleyball. The researcher used the descriptive manner, the survey, as an appropriate method to achieve the objectives of the research, as the researcher used factorial analysis as a picture approach, descriptive. The research sample included 61 juniors, divided into 25 juniors of volleyball and 36 for handball. Selecting the research sample was by using of the method of random sample and included a sample of some Egyptian juniors in volleyball and handball, registered in Egyptian sports federations of the two sports. The researcher applied the 44 anthropometry variables under study on a pilot study, on the number of 30 juniors were selected from junior and outside the sample basic research and that was at 15 juniors of volleyball, 15 juniors of handball and be credited to the validity and reliability of the measurements of anthropometric, has made transactions stability elevated limited between 1 to 0.934, and all statistically significant at 0.01 level, which indicates the stability of measurements. The results of recycling factorial orthogonal for a class volleyball revealed the admission of five main factors,
three factors expatriates, that the results of recycling factorial orthogonal to the category of handball revealed on the acceptance of three key factors, five factors other than pure, that the results of recycling factorial orthogonal to the category of volleyball revealed for the admission of five key factors are: along the lower limb, lengths and offers some parts of the body, circumference of upper limb, obesity of the upper part, of the lower limb and three factors expatriates, that the results of recycling factorial orthogonal to the category of Handball revealed on the acceptance of three key factors are the breadth, obesity and circumferences and five factors other than pure, there are significant differences in the abstract level 0.01 between both volleyball and handball from the results of anthropometric measurements, the values of ‘t’ calculated ranged from -0.77 to 22.17, in light of the objectives of the research and the limits of the sample and on the basis to refer to the results and conclusions, the researcher recommends that the anthropometric measurements, resulted from the current study, are among the most important foundations which take into account when choosing players of volleyball and handball.

Malá et al. (2010) presented the profile and comparison of body composition of the female national volleyball team of the Slovak Republic (senior team – SNT, U19 and U17). The body composition was identified with the use of the multi-frequency bioimpedance method (BIA 2000M). The monitored parameters included the amount of lean body mass (LBM), intra- (BCM) and extra cellular mass (ECM) and BCM proportion in LBM (CQ), fat mass (FM), the phase angle indicating cell quality (α), total body water (TBW) and its distribution into intra- (ICW) and extra cellular liquid (ECW). The authors recorded the values of female volleyball players indicating their good training load and corresponding to the values characterizing high performance.

sport even in the category U17, when this team significantly differed from the
senior team (SNT) only in FM (p<.05). On the contrary, teams U19 and SNT
were significantly different in FM, TBW, α, BCM, ECM/BCM, ICW, ECW and
CQ (p<.05). We assume that body composition indicators of the team may relate
not only to the state of training load (players’ physical preparedness) but also to
the success of the team at important events.

Koley, Singh and Sandhu (2010) evaluated the study of
anthropometric and physiological characteristics on Indian inter-university
volleyball players. The purpose of this study was of two-folds, firstly, to
evaluate the anthropometric profile of Indian inter-university volleyball players
and, secondly, to search the correlation of body mass index, % body fat, hand
grip strength (right dominant) and Vo2max. with other anthropometric
characteristics studied. Eleven anthropometric characteristics, four body
composition parameters, two physical and two physiological variables and nine
arm anthropometric characteristics were measured on randomly selected 63
inter-university Indian volleyball players (38 males and 25 females) aged 18-25
years from Guru Nanak Dev University, Amritsar, Punjab, India with adequate
controls (n = 102, 52 males and 50 females). The results indicated that male
volleyball players were taller (6.63%) and heavier (7.31%) and female volleyball
players were slightly taller (0.31%) and lighter (3.74%) than their control
counterparts. One way analysis of variance showed significant (p≤0.004-0.000)
between group differences in all the variables (except hip circumference)
between volleyball players and controls. In volley players, significantly positive
correlations were found with BMI and other 19 variables, with percent body fat
and 6 variables, with right hand grip strength and 20 variables and with Vo2max
and other 19 variables, and significantly negative correlations were found with

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percent body fat and other 16 variables, with right hand grip strength and other 7 variables and with Vo2max with other 8 variables. The findings of the study might be useful in future investigation on player selection, talent identification in volleyball and training program development.

Gaurav, Singh and Singh (2010) conducted the study of anthropometric characteristics, somatotyping and body composition of volleyball and basketball players. 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.

Defne, Bilgehan and Tuba (2010) the aim of the study was to compared the dominant hand anthropometric rational differences between adult elite volleyball players and sedentaries. In this study, totally 100 subjects (mean age 23.9±3) participated and, they are separated as 25 male volleyball players, 25 female volleyball players, 25 male sedentaries and 25 female sedentaries, respectively. The objects of volleyball levels (elite or non elite) are evaluated by an individual questionnaire data form. Length, weight, hand length, hand width, metacarpal width, hand finger length, hand wrist circumference and hand wrist width are measured by anthropometer, stick, tape measure (international standards, millimetric) and the data are analyzed statistically with t-Test and Two-Way ANOVA. With the measurements stated above meaningful differentials are found between volleyball players and sedentary related to length, weight, hand length, hand width, metacarpal width, hand finger length, hand wrist circumference and hand wrist width. Theoretically, it is assumed that elite sportsman and woman represents the most appropriate physical structure related to the sport branch performed. In this context, anthropometric measurements of sportsmen and women are at higher degree than sedentary. In this study, anthropometric hand measurements of volleyball players and sedentaries (related to gender variable) were found different. As a result, it was found that the meaningful difference related to anthropometric measurements of dominant hand result from the performed sport branch.

Abraham (2010) analyzed the study of anthropometry, body composition and performance variables of young Indian athletes in southern region. The purpose of this study was to analyze the anthropometry and body

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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 somatocart 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. The results of the study indicated that in comparison to other sports disciplines track and field athletes have lower body fat percentage.
The analysis showed that athletes of various track and field events statistically differ in morphological measures, especially in dimensions of body volume and body fat. On the manifest level, only upper arm and lower leg circumference statistically differ, being significantly higher in sprinters and throwers, as well as the sub-scapular, supra-iliac and abdominal, chest and arm skinfolds, which is significantly higher in throwers. The lowest value of % body fat was present among sprinters which are reflected in their lower values of skinfold measurement. It was also evident that in relation to their skeletal dimensions they tend to be more heavily muscled than others and this may be advantageous for them at the start of the race and in the initial stages of acceleration as greater force is created by these muscles. In all groups, mesomorphic component is highly dominant while endomorphic component is the least marked. The present data may be considered to serve as a reference standard for the anthropometry and body composition of Indian track and field athletes.

Rami and Silawat (2009) conducted a study of the psychological factors, anthropometric measurement and physical fitness of selected university players in Gujarat. The thirty individual and team sports players were selected randomly for this study from Athletics, Kabaddi, Kho-Kho, Basketball, Volleyball and Handball games. The cattle’s 16 P.F. test were used for psychological factor, Norjan and Johnson test were used for anthropometry and A.A.H.P.E.R.D. youth fitness test were used for physical fitness components. Analysis for data mean and standard deviation were applied. Results of the study revealed that the players of Athletics were proved better level of physical fitness they showed score in Anthropometry measurements than other team games. The players of Kabaddi were significantly better in psychological factor, where in Anthropometry measurements showed reliable and have shown lower level in

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physical fitness than compare to others factors, where in Anthropometry measurements showed reliable and have shown lower level in physical fitness than compare to others factors. In the game of Kho-Kho players were better in physical fitness and psychological factors where as in the Anthropometry measurement they wee lower. The score of basketball players were average Psychological factors and Anthropometry measurements but they were lower in physical fitness. In compare to other games the players of volleyball were shown better in physical fitness and were not shown up to mark in psychological factors and Anthropometry measurements, and in last the players of Handball were shown medium score in Anthropometry measurements and psychological factors and the level of physical fitness was not shown as mark able than compare to other games. From the study of Psychological Parameters revealed that, the players of all games were seen reserved, critical, cool, emotional, mild, easily upset, conforming, accommodating, sober, prudent, serious, shy, timid, trusting, tough minded, confident serene, self-reliant, affected by feeling. In parameters if psychological factors kabaddi’s players were shown more significant as compared to other games, while volleyball players were for away from these factors. The results from the analysis of anthropometry measurement the players of Kabaddi’s highest in Height, Weight and circumference of chest, upper arm, thigh and calf, were as players of kho-kho’s has shown lower in above sighted variables. The results revealed from analysis of physical fitness Athletics players were superior as compared to other games, where as basketball players were lowest.

Barut, Demirel and Kiran (2008)\textsuperscript{16} evaluated the study of hand anthropometric measurements and grip strength in basketball, volleyball and handball players. This cross-sectional study was performed to compare hand

anthropometric measurements and grip strength among different sports groups. The study group was composed of 145 basketball players, 133 volleyball players and 96 handball players aged between 9-18 years. A digital compass (Shan, 150 mm) with a resolution of 0.01 mm/0.0005 inch was used for hand anthropometric measurements and a digital hand dynamometer (Takei) was used for grip strength measurement. During measurements values for both hands were obtained. Eight parameters were evaluated for each hand. For statistical analyses One Way ANOVA for parametric conditions and Kruskal-Wallis Variance Analyses for subgroups which have nonparametric conditions were performed. The differences within the groups were evaluated with post hoc Bonferroni adjustment. There were statistically significant differences for right and left hand width, right finger index, right hand length/height, left hand length/height values between basketball, handball and volleyball players. The differences between basketball and handball players were the reason for the aforementioned differences. There were statistically significant differences in right and left width, right and left third finger length, right and left hand grip strength values in females. These significances were caused by handball players. These findings suggest that different sports could constitute different effects on hand anthropometric measurements and grip strength and sex should be considered.

**Earle (2007)** presented the study of the construct of mental toughness: a psychometric and experimental analysis. Mental toughness is a familiar and commonplace term in both the sporting arena and the workplace. However, attempts to investigate the nature of mental toughness have been inconclusive and, following more than twenty years of research, the construct remained ill-defined. As a consequence of this lack of an accepted definition, a series of different strands of research were then undertaken, but each produced differing

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conceptualisations of the phenomenon. The work presented in this thesis represents an attempt to address these issues using both psychometric and experimental approaches. Preliminary work investigated the psychometric basis for the construct of mental toughness and enabled the development of a multidimensional measurement tool. This work was followed by a series of four experiments: The first two experiments focused on the moderating effects of mental toughness on the impact of physical and cognitive stressors, and the final two experiments considered the changes in mental toughness in individuals facing new life challenges and a mental toughness training programme. Both experimental and psychometric analyses supported the proposition of a meaningful construct with real world applications. The evidence in support of a psychometrically sound construct was particularly strong and the beneficial effects of superior mental toughness were highlighted in both the physical and cognitive studies undertaken. Most importantly, in terms of applied sport and occupational psychology, self ratings of mental toughness and objective performance were enhanced following exposure to appropriate psychological skills training.

Aytek (2007)\textsuperscript{18} studied the body composition of turkish volleyball players. In this study, 60 male and 60 female volleyball players body composition were estimated. 43 of them are playing in national teams in different categories. In this study, bioelectrical impedance methods were used. Because this method was more rapid and cheaper than others. Tanita BMC-148 body composition analyzator and standart anthropometer were used in this examination. The results revealed that there was a significant difference between Turkish male and female volleyball players (p<0.05). And there was a significant difference between the categories. In addition this, Turkish volleyball

players have similar body compositions with other volleyball players in all over the world.

Creasy Jr. (2005) analyzed the components of mental toughness in sport. Many coaches are becoming aware of the importance of developing mentally tough performers and are designing programs to develop it in their athletes. One of the most significant problems in designing these programs is the inconsistency in the definition and description of mental toughness. If programs are to be designed with the goal of developing mental toughness in athletes, the components of the construct must be identified. Based on the advantages that mental toughness can offer to the performer, this study was designed to develop an understanding of the components of mental toughness in sport. The purpose of this study was to identify the components of mental toughness as perceived by National Collegiate Athletic Association (NCAA) coaches and was guided by two fundamental questions: what are the essential components of mental toughness? and to what degree are these components teachable (trainable). Twenty-two NCAA coaches were selected to participate from a mix of Division I, II, and III male sports teams. The procedures for this study were divided into a two-phase approach. Phase-one consisted of each participant completing a questionnaire for the purpose of evaluating the importance and teachability (trainability) of 20 separate components of mental toughness. Phase Two consisted of follow-up, semi-structured interviews that provided further insight into the perspectives of the participants. The results of this study indicated the essential components of mental toughness based on their importance to the construct. The results also indicated the degree of teachability (trainability) of each component. A unique relationship between teachability and trainability was also revealed in this study. These findings provide a better understanding of the

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components of mental toughness and support the need for its development in sport.

Wisloff et al. (2004) conducted the study to determine whether maximal strength correlates with sprint and vertical jump height in elite male soccer players. Seventeen international male soccer players (mean (SD) age 25.8 (2.9) years, height 177.3 (4.1) cm, weight 76.5 (7.6) kg, and maximal oxygen uptake 65.7 (4.3) ml/kg/min) were tested for maximal strength in half squats and sprinting ability (0-30 m and 10 m shuttle run sprint) and vertical jumping height. Result showed that there was a strong correlation between maximal strength in half squats and sprint performance and jumping height. They concluded that maximal strength in half squats determined the sprint performance and jumping height in high level soccer players and high squat strength did not imply reduced maximal oxygen consumption and also elite soccer players should focus on maximal strength training, with emphasis on maximal mobilisation of concentric movements, if they want to improve their sprinting and jumping performance.

Shaw (1999) compare among the selected level of sports achievement namely zonal, inter zonal/state, national and non-participation on SAMT (Sports achievement motivation Test) scores of schoolboys and girls independently; to compare among the selected levels of sports achievement namely inter-collegiate/state, national/inter-university/ inter-national and non-participation on SAMT score of college boys and college girls independently and to compare among the selected levels of sports achievement on SAMT scores of schoolboys, college boys school girls and college girl’s independently. The study was

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conducted on 68 males and 14 males from selected school and 56 male and 51 females from selected colleges were randomly sample with age ranging from 11-20 years at school level and 17-26 years at college level sport achievement motivation Test (SAMT) developed by Dr. M.L. Kamalesh, was administered on the selected subjects as per instructions to obtain SAMT scores. The findings and the study indicates that significant sex differences were observed on SAMT scores between: School boys and girls at national/international level; College boys and girls at inter zonal/state level at 0.05 level of significance.

Singh, Sharma and Singh (1994) conducted a comparative study of ability of attacker and set-upper in volleyball. The 44 male volleyball players (33 attackers, 22 set-uppers) of university and state levels were taken as subjects. Ten motor ability tests, along with age, body weight and standing reach were taken separately for the two groups, attackers and set-uppers. The mean, standard deviation and ‘t’-test were used as statistical tool. It was found that attackers are significantly younger, heavier and taller than set-uppers. The attackers and set-upper do not differ significantly in test except basketball throw. But attackers are better in 40 mt. sprint, standing vertical jumps, 9-3, 6-3-9 meter agility and 2.4 km. run. Set-uppers are better in block jump, forward bend reach and bend knee sit-ups.

Sukkasem and Vijit (1989) conducted a study to measure and compare height, weight, weight residual, skinfolds thickness, % of body fat, 11 body circumferences, strength, flexibility, reaction time and the resting electro – cardiogram of 80 Oklahoma state university male students between 20-31 years of age from middle east, east and south east Asian countries who were selected by stratified random sampling. The results were compared with the United

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States population norms. A comparison was also made among the foreign students who had been in the United States less than one year and more than 3 years. Multiple t-tests were used to determine if any differences existed between the groups in the selected physical fitness variables at the 0.05 confidence level. The result of the above study showed that the United states had a significantly higher mean value of height than the middle east students and also had significantly higher mean values of height and weight than the east and south east Asian students. The middle east had a significantly higher mean value of the sum of the six sites of skinfolds thickness than east and south east Asian students. The middle east has a significantly higher mean value of the body circumference of shoulder, chest, buttock, thigh, forearm and ankle than those of the east and south east Asian students. The middle east had a significantly higher mean value of the circumferences of shoulder, biceps, wrist and ankle than the united states. The east and south East Asia had significantly higher mean values of shoulder circumference than the United States. The Untied States had significantly higher mean values of the circumference of the shoulder, chest, abdomen, buttock, forearm, thigh, knee and calf than south East Asia. The Untied states had significantly higher mean values of left and right arm grip strength than the Middle East and south East Asia.

**Gowda (1989)**\(^{24}\) carried out the comparative study of selected physical fitness variables among Kabaddi players based on positional play. 120 Kabaddi players were selected as subjects from the Mysore University intercollegiate tournaments. These subjects were divided into three equal groups of forty each, under offensive, defensive and allround categories. The physical fitness variables will be selected for this study were strength, speed, endurance, agility, power and muscular endurance. The following test were administered to obtain

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the data (1) flexed arm hang (2) sit-ups (3) shuttle-run (4) standing broad jump (5) 50 yard dash (6) Burpee test (7) chin-ups (8) half squat jump test (9) push ups. The results revealed that there were no significant difference among offensive and defensive and allround groups in any of the physical fitness variables.

Singh and Gill (1988) conducted a study to examine the physical and physiological characteristics of Volleyball, Football players and cross country runners. Members of Punjab University Men's Volleyball team (N=12), Football team (N = 16) and cross country runners (N=15) were taken as subjects. Age, weight and height were recorded, skinfold measurements were taken to calculate percent body fat and lean body weight. Under physiological variables vital capacity, maximum breath holding capacity, maximum expiratory pressure, heart rate, systolic and diastolic blood pressure were taken and a dynamic cardio-pulmonary index was calculated. Results showed that Volleyball players were taller and heavier than Footballers and cross country runners and had higher cardio-pulmonary index.

Uppal and Roy (1986) conducted a study on assessment of motor fitness compound or prediction of soccer playing ability. The 33 male soccer players attending coaching camp prior to inter-university students were taken as subjects. Five motor fitness compounds speed (50 mt. dash), agility (4x10 mt. shuttle run), maximum leg strength (leg dynamometer), explosive leg strength (standing broad jump) and cardio-respiratory endurance (Cooper’s 12 min. run/walk test) were administered on graded subjects out of 50 marks in playing ability by three judges: Result showed that independent variable (speed ML

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strength, EC strength and cardiovascular strength) were significantly related to dependent variable. Since the multiple correlation co-efficient is higher than zero order correlation coefficients, therefore, further better performance in soccer all the independent component chosen must be considered.

**Sridhar (1984)**\(^{27}\) made a study to determine relationship of power, agility, flexibility, muscular endurance and circulo-respiratory endurance to volleyball playing ability. Subjects were 30 volleyball players studying in L.N.C.P.E., Gwalior. Sargent jump was used to measure power. Slide step test to measure agility, trunk flexion for flexibility, pull-ups and bent-knee sit-ups for muscular endurance, and one minute lateral jump test to measure circulo-respiratory endurance. The playing ability of each player was judged by a panel of three experts. Product moment correlation was computed to statistically analyze the data. The findings of the study led to the following conclusions: 1) Power was the most significant motor fitness component that contributes successful performance in volleyball; 2) muscular endurance, circulo-respiratory endurance and flexibility also contributed to the volleyball playing ability and 3) agility showed an insignificant relationship to volleyball playing ability.

**Moralidharan (1984)**\(^{28}\) tried to find the relationship of anthropometric and physical performance variables measures to performance in long jump. Product moment correlations were computed to see the relationship of long jump performance to each independent variable such as standing brad jump, 50 yard dash, shuttle run (4 × 10 yards), sit and reach, vertical jump, leg length, height and weight. The data were tabulated in the form of scatter grams. The findings of the study indicated that the anthropometric and physical performance

\(^{27}\) Sheela Kumari Sridhar. “Relationship of Selected Motor Fitness Components to Playing Ability in Volleyball”, *(Unpublished Master’s Thesis, Jiwaji University, Gwalior, 1984).*

variables are very reliable for predicting long jump performance. Conclusions were 1) Leg length, height, standing brad jump, 50 yards dash, shuttle run (4 × 10 yards), sit and reach, vertical jump were the most significant independent measurements in the prediction of running long jump, 2) body weight did not prove to be reliable when single independent variable was correlated with the performance of running long jump. Therefore, weight should not be used singly for predicting performance in running long jump.

Mathew’s (1984) study says was undertaken to determine the relationship of selected anthropometric measurements (height, weight, arm length and upper body length) to performance of Brady Volleyball test. Pearson’s product relationship of Volleyball playing ability to each of the selected anthropometric measurements. For testing the hypothesis the level significance was set at .05. The finding of the study indicated that the variables of height, weight and arm length showed significantly higher relationships to performance on Bradly Volley ball test, (Weight = .764, Weight = .795, arm length = .792) as compared to the significant but low relationships of leg length and upper body length with performance on Brady volleyball test (leg length = .544, upper arm length = .641). All the above-mentioned values were found significant at .05 level of confidence. Based on the findings of the study the following conclusions were drawn: 1) The height and weight of the players contributed to a much greater extent to the performance of Brady volleyball playing ability. 2) Arm length was also found to be an advantageous factor in the performance of Brady Volleyball test. 3) Leg Length and upper body length contributed to the performance on the said test to a very limited extent.

Kela (1984) undertook this study to find out the relationship between speed of movement (Nelson method), agility (shuttle run) and spine and shoulder flexibility (flexometer) to performance in gymnastics on twenty five inter-university women gymnasts at Amritsar in 1984. Rank-difference method of correlation was used in order to find out the relationship. It was concluded that: 1) agility has a significant relationship with performance in gymnastics and 2) speed of movement and shoulder and spine flexibility did not contribute to performance in gymnastics.

Dev (1984) studied the relationship of selected physical variables such as strength, arm strength, leg strength, agility, speed, flexibility, anthropometric measurements, weight, height, arm length, leg length, foreleg length, thigh height, ponderal index, crural index to performance in shot-put. Product moment correlation method was used to complete correlation and significance of the study. Following conclusions were drawn from the results of the study: 1) There was significant correlation between arm strength, leg strength, speed, flexibility and shot-put performance. 2) There was no significant correlation between weight, height, arm length, leg length, foreleg length, thigh length, ponderal index, crural index and shot-put performance.

Chauhan (1984) conducted a study to compare the selected general motor ability components, i.e., speed, agility, flexibility, muscular endurance, balance, leg strength, arm and shoulder strength, and coordination of women Basketball and Volleyball players. The subjects chosen were women Basketball and Volleyball players of Lakshmibai National College of Physical Education, Gwalior. Fifteen players in each game were selected and the components were

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tested on the players. The data collected in all the tests were statistically compared by using ‘t’ ratio at 0.05 level of significance. The analysis showed that the women Basketball players were comparatively superior to Volleyball players in arm and shoulder strength. But there were no significant differences between the two groups in speed, agility, trunk flexion, abdominal endurance, balance, leg strength and hand-eye coordination.

Mishra (1983)\textsuperscript{33} made an attempt to establish relationship of selected physical and physiological variables to performance in fifty meter front crawl swimming. He conducted the study in twenty five professional students studying in L.N.C.P.E., Gwalior. The selected variables were arm strength, ankle flexibility, vital capacity and body surface area swimming performance was recorded in seconds. Product moment correlation was computed to analyze statistically the relationship of physical and physiological variables to speed in fifty meter crawl swimming. It was concluded from the findings that 1) there was as significant relationship between arm strength, ankle flexibility and vital capacity to swimming speed and 2) there was no significant relationship between body surface area and swimming speed.

Joseph (1983)\textsuperscript{34} conducted a study to determine the relationship of power, agility, shoulder flexibility, arm length and leg length to volleyball playing ability. The subjects were 30 male volleyball players studying in L.N.C.P.E., Gwalior. Product moment correlation was computed for finding the correlation between volleyball playing ability and each of the selected independent variables. The conclusions drawn from the findings were : 1) power is the most reliable variable in prediction of playing ability of men

\textsuperscript{33} Laljee Mishra. “Relationship of Selected Physical and Physiological Variables to Performance in 50 Meter Front Grawl Swimming”, (Unpublished Master’s Thesis, Jiwaji University, Gwalior, 1983).

volleyball players; 2) arm length and leg length are also reliable variables in prediction of playing ability of male volleyball players; 3) agility and shoulder flexibility were not significant in prediction of playing ability of male volleyball players.

Gill (1983)\textsuperscript{35} conducted a study to see the relationship between grip-strength, arm-strength, hand, foot and stepping reaction times to badminton playing ability. Sixteen district level badminton players were the subjects of the study- Grip dynamometer was used for measuring grip strength, electronic reaction timer for reaction time, Roger’s formula for arm strength and Round Robin tournament for playing ability of the subjects. By using rank difference correlation coefficient the scholar reached the following conclusions : 1) arm strength, hand foot and stepping reaction times were significantly related to playing ability in badminton; 2) grip strength was not significantly related to the playing ability in badminton.

Chaakravarthy (1983)\textsuperscript{36} investigated the relationship between strength, leg strength, grip strength ability, flexibility and balance to performance in gymnastics. For evaluating arm strength, leg strength, grip strength, agility, flexibility and balance the following tests were employed. Arm strength measured by (push +dips) (w/10 + H-60) in pounds. Leg strength by leg dynamometer in pounds grip strength by movements in pound. Agility by shuttle run 4x10 in seconds and spine and shoulder by flexioeasure with yardstick to the nearest inches and balance measured by modified bass dynamic test balance test in 100 points respectively. The findings of the study show significant correlation between arm strength, leg strength left grip strength, agility, spine


and shoulder flexibility to the performance in gymnastics where as right grip strength had significant relationship with gymnastics performance. The level of significance was fixed at .05 level of confidence from the findings of the study. It may be concluded that: 1) Arm strength, Leg strength and left grip strength of gymnast has got no significant relationship with gymnastics performance. 2) Agility of an individual was not a factor in developing the performance in gymnastics. 3) Spine and Shoulder flexibility does not contribute towards gymnastics performance. 4) Dynamic balance and gymnastics performance have insignificant relationship. Right grip, Strength was the most important variable in prediction of performances of gymnastics.

**Basunia (1982)**[^37] studied the relationship of height, agility and flexibility to reaction time, vertical jump and sprinting speed of soccer players. The subjects were the soccer players of the undergraduate classes on L.N.C.P.E., Gwalior. The findings of the study reveal that there was no significant correlation between height and reaction time, vertical jump and speed. There was a high correlation between flexibility and speed (0.53) at 0.05 level of confidence. Flexibility has no significant relationship with vertical jump and reaction time. From this findings it was concluded that 1) agility was the most important variable in the prediction of reaction time and speed of men soccer players but no contributed in the performance of vertical jump; 2) Flexibility contributed much in developing speed but did not contribute in developing the reaction time and vertical jump; 3) Height was not a factor in developing the reaction time, vertical jump and speed; 4) It may be concluded that in selecting soccer players greater emphasis may be given on agility and flexibility.

Bandyopadhyay (1982)\textsuperscript{38} in a study tried to establish a relationship between soccer skill performance and selected anthropometric measurements, physical fitness and motor ability. Thirty male soccer players were randomly selected from the undergraduate classes of L.N.C.P.E., Gwalior to act as the subjects. Subjects were tested in selected anthropometric measurements (chest girth, upper arm girth, thigh girth, calf girth, height and weight), physical fitness (AAHPER Youth Fitness Test), motor ability (Barrow’s Motor Ability Test) and soccer skill performance (McDonald Soccer Skill Test). After computing zero order correlation it was concluded that: 1) there is a high correlation between physical fitness and soccer skill performance and between motor ability and motor skill performance; 2) thigh girth had a significant relationship with soccer skill performance and 3) the upper arm girth, chest girth, calf girth, height and weight had no relationship with soccer skill performance.

The purpose of the study of Kaiser (1981)\textsuperscript{39} was to determine any relationship or differences in pain tolerance and mental toughness with the collegiate football players. The study was conducted on 65 varsity football players of Idaho State University. In order to measure pain tolerance and mental toughness the author made use of an adaptation of Poser’s mechanical gross pressure stimulator and the athletic motivation inventory respectively. The statistical analysis included correlation coefficients for variables and an inspection of unit and position means. The conclusion of this study was evident between the pain tolerance and mental toughness within collegiate football players.

\textsuperscript{38} Subhas Chandra Bandyopadhyay. “Relationship of Selected Anthropometric Measurements, Physical Fitness and Motor Ability to Soccer Skill Performance”, \textit{(Unpublished Master’s Thesis, Jiwaji University, Gwalior, 1982)}.

Gladden and Colacino (1978), studied the height, weight, skin folds, vertical jump and maximal anaerobic power of 88 female participants of the 1974 United States Association National Tournament. The volleyball player were (172.2 em.) tall with (68.5 kg.) of weight, with regard to total skin folds. The players were very lean when compared to the national population of females. The final standing in the tournament was significantly correlated with age, height, vertical jump and maximal height on jump. The partial rank correlation showed that height and vertical jump were the major factors correlated with final standing.

Christian (1975) identified the contribution of selected variables to the football game performance. Thirty members of the Southeastern State College Football Team were chosen as the subjects. Each subject was tested on 12 variables, and a stepwise multiple regression was used to determine the weight of each of these variables to the ultimate criterion, the percentage of plays executed correctly as determined by grading the film of the ten 1973 regular season football games. It was found that the best predictor of the game percentage score for the backs was lateral movement with a correlation of .33. For the line, the best predictor of game percentage score was bench steps with a correlation of .67. When the back and line groups were combined the best predictor of the game percentage score was the vertical jump with a correlation of .50. It was concluded that for the total group, the vertical jump and the twelve minute run were the two best predictors.

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Talton (1973)\textsuperscript{42} made a study to determine whether selected physical and psychological assessment can be utilized as the predictors of successful interscholastic football players. Subjects were 156 football players selected from eleventh and twelfth standards of a public school and the subjects were grouped as successful and unsuccessful footballers based on the performance in the 1971 football season. The 34 structural, strength, motor and psychological assessments in this study were statistically evaluated as a combination of variables which have a high predictive power in differentiating the successful footballers from the unsuccessful ones. A single predictive variable was not identified; however two combination of variables were selected such as the Short Test Battery and the Long Test Battery.

Smith (1969)\textsuperscript{43} did a study to establish the relationship between volleyball playing ability and the scores achieved in the Sargent jump. Subjects were 68 beginning volleyball players, 11 varsity volleyball players and 3 highly skilled and experienced volleyball players. It was observed in the study that vertical jump correlated 0.35 with the Brady Volleyball test, 0.55 with the judges evaluation and 0.50 with a combination of Brady Volleyball test and judges evaluation for the beginning players. The ‘r’ between the vertical jumping ability of the varsity players and potential playing ability ranking by their coach was 0.36. Conclusion was drawn that the vertical jump is not an accurate predictor of volleyball playing ability.
