Chapter -II

Review Of Literature
REVIEW OF LITERATURE

The Researcher had undergone a vast survey of related literature. He had appraised various journals, books periodicals etc. related with various aspects of this study. The important studies having specific relevance with the undertaken study are cited below.

**Sodhi & Sidhu In (1991)** found D.,H., S. (Discus Hammer and Shot put) throwers to be significantly taller (182.4cm) and heavier (88kg) than all other field event athletes. On the other Javelin throwers are the shortest (172.3cm) but the L.H., T. (Long, High, Triple) jumpers have the least weight (60.8kg). The athletes of L.H. & T-group are significantly taller than the controls, but pole-vaulters and D. H. & S. throwers are both significantly taller and heavier than the latter. The Javelin throwers, on the other hand, do not show any appreciable difference in stature but in weight they are significantly heavier than the controls. Almost similar results have been obtained on the athletes of Olympic field events. However, their fellow Javelin throwers were taller than the jumpers.

The throwers in D.H.& S. group have the largest sitting height, biacramial diameter, bicrystal breadth, and chest circumference than those of the controls and all other groups of athletes. Most of these measurements are significantly, greater at 5% level. The Javelin throwers and pole-vaulters do not show much difference in trunk measurements. The category of jumpers (L.H.&T.) have evidently smaller trunk diameters than those of throwers, except the bicrystal breadth which is 0.7 cm shorter in the case of Javelin throwers.

Like the stature and track measurements, the D.,H., & S. throwers are found to have larger upper extremities among the athletes of all track and field events. On the other hand, the Javelin throwers have the smallest
length of limbs and the L.H. & T. Jumper have least circumference of upper arm among the athletes of field events. The pole-vaulters dominate the L.H.&T. Jumpers and Javelin throwers in the measurement of upper extremity length.

The S.,D.,H. throwers, who have the largest trunk and upper extremity measurements, approximate the L.,H.&T. group in the lower extremity length. The Javelin throwers have been found to have significantly the least average values of lower extremity length in this group of field athletes. However, among them the circumferences are significantly largest in the case of D.,H.&S. throwers and smallest in the case of L.,H.,T. jumpers.

The hip breadth is more developed in relation to stature in the throwers of D.,H.& S. group. However, the L.,H.&T. jumpers are more slender in this respect. The relationship of the chest circumference with stature is variable among the field athletes. It is again in the D.,H.&S. group that the athletes have a proportionately larger thoracic region, but the L.,H.&T. jumpers are most slender in this respect.

**Tanner in (1964)** observed discus, Javelin and Hammer throwers and Shot putter to somatotype around 3-6-2 or 3.5-6-2. The track athletes and the Jumpers, on the other hand, had Somatotype mostly ranging between 2-5-3 and 2-4-3-5. Among the runners, there was a clear difference between sprinters and others. The average Somatotype of the sprinters was 2.5-5.5-3, of the 400m runners, 2.5-4.5-4 and of the 1500m, 5000m and marathon 2.5-4-4.
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Mokha R and L.S. Sidhu, (1988) carried out a study on Indian athletes of different levels of competition. Six skin fold measurements (Biceps, triceps, forearm, subscapular, suprailliac, calf) were made on 157 track and field athletes (42 throwers 35 jumpers, 80 runners) the range of ability of the athletes ranged from state (highest level) through Intervarsity to district (lowest level) 81 subject acted as controls. Total body fat was calculated by the formula of Durnin & Womersly (1974) it was found that the throwers significantly had more fat of all the six measurement parameters than the jumpers & runners. The jumpers & runners did not differ much from each other. With the increasing levels of competition, tend of increasing in fat was observed in throwers & a decrease in jumpers & runners.

H.S. Sodhi in (1991) concluded Discus, Hammer and Shot putter to be taller, heavier and posses longer extremities and broader knees with a larger amount of lean body mass. As already mentioned their greater weight is useful, because when the object is thrown forwards and upwards, an equal and opposite reactive force is exerted on the athlete, pushing him backwards and downwards. The effect of this reaction is however, more if he is lighter. The greater height in their case will be of further advantage by making the flight of the implement longer before it touches the ground. Further while throwing the Discus, speed of the Discus at the moment of release is of prime importance in determining how far it will go and for a given angular velocity, the speed is proportional to the length of the ‘lever’ throwing the Discus from the axis of the thrower hence the desirability of long as well as powerful arms. The greater size of the throwers in all dimensions contributes to increase the proportionate body weight of these athletes. The stresses of weight
bearing in the case of the throwers may be responsible for broadening their knees. The better development of the lean body mass will help them to provide the great strength required in the throwing events.

Carter in (1970) observed that the throwers of Discus, Shot, Javelin and Hammer differed greatly in physique from the other athletes. As group, they were taller and heavier with longer arms in relation to their legs. They had broader shoulders and broader hips even for their trunk size, and were somewhat fatter than the track athletes. Their proportions of legs to the trunk were similar to those of middle distance runners. The Shot putters were also very large and muscular men. None was under 185 cm and the tallest shot putter was 195 cm and weighted 115kg. They also had long arms, but not so long as those of the Discus throwers. Like the Discus throwers, they had wide humerus in relation to the breadths of the femur and tibia. The large arm bone was not seen in Javelin and Hammer throwers or in the sample of weight lifters.

Cureton (1951) studied 22 track and field champion athletes of the United States and reported typical track men to be slight in skeletal framework with longer forelegs relative to thighs and longer legs relative to the length of the trunk, but were exceeding well muscled. The Jumpers, hurdlers and vaulters were relatively slim in skeletal build and were typically taller with longer legs and shorter trunks. The shoulder width/Biiliac hip width index was shown to be important for differentiating Javelin throwers and gymnasts from other types of athletes. The typical throwers (including Shot putters) were those with greater arm span/height and greater upper arm length/ forearm length. The jumper’s hurdlers and vaulters had relatively great leg length/trunk length and relatively large foreleg length/ thigh length. The success of athletic champions is not fully
explained by inherent anthropological body type measurements, because among men of approximately the same physical type, there are great differences in performance. Developing the proper skill takes many years of patient training of the muscular system.

**Parnell (1951)** worked on university athletic club athletes and found all groups of Athletes taller than the controls. Of the athletes, the Javelin throwers, Discus throwers and Shot putters were tallest and sprinters shortest. With regard to the mean weight, middle and long distance runners were the lightest athletes though not lighter than the control group. All other types of athletes had the mean weight above that of the controls. The reciprocal of ponderal index was found to be lowest among heavy event athletes who also registered a small range. The highest value of this index was in the case of the long distance runners, with an average build equal to that of the control series. In comparing sprinters with the controls it had been noticed that especially the 100-yard sprinters were distinguished by a heavier physique and by being more muscular than the average. For long distance runners, the value of reciprocal of Ponderal index higher than 13.6 may indicate that the weight of musculature is too slight for this task. Subischical length was shortest among the controls, slightly greater in sprinters, greater still in long distance runners, High jumpers and Hurdlers and greatest in the small group competing with Discus, Javelin and Shot. The conclusion was reached that an individual’s choice of athletic events might be recognized in greater degree, to be because of the characteristics probably inborn than those recognized previously.
Telka and his Associates (1951) studied 245 Finish top ranking track and field athletes and wrestlers. They did not find any appreciable differences in respect of constitution among the athlete of different branches, except in certain extreme groups. However, they found them different from the control sample. They stated; according to that material body build of a definite type did not appear to be a necessary prerequisite to the achievement of good athletic results. However during 1954, the same workers again reported the top-ranking track and field athletes and related various body measurements to performance. Throwers were tallest in this material and they seemed also to benefit most from their height. The correlation between the relative shoulder breadth (with stature) and performance was significant in throwers and long distance runners. The correlation between the relative shoulder breadth (with stature) and performance was negative and highly significant in the case of the throwers. The correlation between the relative chest circumference (with stature) and performance was negative and highly significant in the case of sprinters and positive and significant in case of throwers.

Malhotra et. al. (1972) studied the functional capacity and body composition of the throwers, Jumpers, sprinters and the middle and long distance runners. The track men and jumpers were found to have a higher lean body mass with less fat content than the throwers who were tall and heavily built. The middle and long distance runners had highest and the throwers, the lowest maximum O² intake capacity values in terms of body weight and lean body mass. Similarly, the track men had lower maximum heart rate than the other group of athletes. The jumpers and throwers had stronger muscle power, however, the later were stronger in arm and shoulder muscle strength too.
Muthiah & Venketswaru (1973) studied the Indian track & field athletes and noticed the throwers to be heavier, taller and older than other athletes. Among runners, the age increased and the height and weight decreased with the increase in the distances, they run. The jumpers and hurdlers were taller and heavier than sprinters, but were shorter and lighter than throwers. The decathletes were the second heaviest, they were all rounders.

Sidhu and Wadhan in (1974) worked on throwers, who were found to be heavy and tall with relatively large limb circumferences and bicondylar diameters. They had better developed lean tissue in the limbs associated with greater amount of fatty tissue.

Sidhu et al. (1975) took the upper roentgenograms and some anthropometric measurements of 22 throwers and compared them with 45 normal non-athletes. The throwers were found to be significantly taller and heavier with bulkier builds of larger circumferential measurements and skeletal measurements. Their lean body mass was greater than that of the control sample. Roentgenormetric assessment displayed that the constant throwing exercise had resulted in greater development of the upper arm muscles, especially the triceps.

Hirata (1966) reported data in respect of the participants of Rome, Tokyo, Munich and Montreal Olympic with respect to different games and events. Among athletes, the short and middle distance runners and jumpers were, as a whole, younger, but the long distance runners and throwers were older. These data indicated that the participants in events which need great muscular strength reached the climax in the early period, whereas the participants in events, which needed much endurance or technique, had delayed climax, which continued longer.
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Kohlrausch in (1929) studied the athletes who participated in the 1928 Olympic Games at Amsterdam, and arranged all his athletes into fifteen different groups, but these again could be grouped into three major classes:

Slender types: - These include runners, Jumpers, hurdlers, with relatively long legs and slender bodies.

Medium types: - These include decathlon and Pentathlon athletes, boxers, ball-players and swimmers.

Massive Types: These include weight-throwers, weight lifters and up to point gymnasts.

Arnold (1931) reviewed studied of various workers and concluded three main types. gymnastic types with relatively long bulk, coupled with breadth.

Wrestler types with mighty forms, great breadth of shoulders and Pelvis coupled with great breadth and depth of chest. Pentathlon types-with medium to slender bodies, relatively long legs and less breadth.

Krakower (1935) Reported on 16 high Jumpers and found that the type of the individual that succeeded in high jump had long legs, a short body and broad feet.

Vujovic d. and lozovina v. (1999) examined the differences between two groups of elite athletes’ anthropometric measurements. The groups were from sports of water polo and rowing. Subjects were measured with set of 18 anthropometric measurements. Multivariate analyses on manifested measurements as well as on scores on latent dimensions were employed to analyze the difference between the groups. Differences were based on differences in measurements. Which can be attributed to muscle tissues and fat tissues, which were both in favour of
water polo players. There were no differences in measurements of skeleton except for the measurements of bicristal width and leg length. Different training procedures and different surrounding in which activities were taking place cause the differences. No differences in skeleton measurements were the consequence of the selection process.

Heaths Carter in (1982) found athletes who wish to achieve success in sports at a high level can compare their physique with those of Olympic athletes. If the athlete is within the limits of the Olympians, then the appropriate structure for high performance is achieved. Consideration can then be given to whether changes in physique, such as lower body fat or increased muscles mass would enhance or hinder his performance. This problem is of special significance in games like weight lifting boxing, judo and wrestling which are competed on the basis of body weight. In these games, the competitors are required to compete within their respective weight categories. Out of many measures of physique, the stature being of most common interest, has been thoroughly investigated. It has already been mentioned that in same sports greater height is an advantage. Whilst in others, shorter stature is preferable. All these studies are based on adult athletes who in most cases are a product of many years of training starting from childhood.

Kroll (1954) conducted a study on somatotype of 36 wrestlers from universities in mid western United States. Where the mean Somatotype of his subjects was 2.7-5.0-3.8, mean height was 174.8 cm, mean weight was 73.1 kg while height weight ratio was 12.87. The wrestler had longer upper extremities, longer trunk and shorter lower extremities, which bring down the center of gravity and thus help in increasing stability
Singh S.P. and Malhotra P. (1986) conducted a study on Indian National cyclists. Anthropometric measurements were taken on 34 male and 9 female Indian cyclists who were attending a national coaching camp at Patialia with a view to evaluate their body composition, morphology and Somatotype. The measurements were taken in the morning to avoid any possible effects of fatigue on height and other body dimensions. Body fat was calculated from skin folds using the formula devised by Durnin and Womerslay (1974) and Somatotype was assessed using the Heath and Carter (1967) method. The male and female cyclists were significantly heavier and possessed greater limb girths and skeletal diameters than their control counterparts. The percentage of body fat was similar in female cyclists and controls. The cyclists showed a greater development of musculo-skeletal tissue of the lower extremity relative to height than controls. The Somatotype of male and female cyclists were 2.76-3.90-3.21 and 5.17-3.22-2.56, respectively. Compared to the control groups, the cyclists of both sexes were more mesomorphic and stocky. Since the maximum share of the power transfer to the pedals is that of the lower extremities, therefore, highly developed muscles of calf, thigh, buttocks and hips of the cyclist seem to have a definite advantage.

Keogh j.w.l. et al. (2000) carried out a study to assess the performance of senior female field hockey players (both regional representatives and amateurs) on a number of physical fitness, anthropometric and hockey-related skill tests. Physiological tests included 10m and 40m sprint, 6x40m repeated sprint test (5), multistage aerobic test, standing long jump, agility test, body mass, height and sum of four skin folds. Skill levels were assessed using pushing power, as well as dribbling and accuracy tests. Results showed that differences in a number
of measurements occurred between the two groups. No differences were found on performance measurement between subjects in the follicular or lateral stage of the measurement cycle. The present study demonstrated that both physical characteristics and technical skill were important components of performance in senior female hockey players.

**Medved (1966)** Studied the height and weight of sportsmen and sportswomen in a city. The greatest deviations, regarding height in the positive sense were observed in basketball players, volleyball players and swimmers, whereas wrestlers, boxers and figure skaters were among the sportsmen showing deviations in height in the negative sense.

**Sidhu and Anand (1971)** Studied 42 athletes and 46 non-athletes in which the former were found to be taller and heavier than the later. The non-athletes were seen to possess higher amounts of subcutaneous fat than the athletes.

**Wood R.J. et al. (2000)** compared initial field test results of indigenous and non indigenous Northern Territory Institute of Sport (NTIS) AFL squad players. The indigenous players were significantly shorter and tended to be lighter. They were also significantly faster over 40m, due to better acceleration, which supports the stereotype. Other measurements of anaerobic and aerobic power were not different. Further analysis showed the six regional based indigenous players achieved lower scores of fitness than their city-based counterparts. Analysis of playing positions showed a greater representation of indigenous players along the centerline. While there were more nonindigianous players in key field positions, the track and along the half lines. Positional segregation has also been founded in Rugby League (Hallinan 1991). The positional
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differences may relate to the body size requirements for each position. While skill and agility were not measured, the smaller and lighter indigenous players may require greater agility and skill levels to compare with larger non-indigenous players.

In a study conducted by Ambegaonkar and Dikshit (1964), on 27 Indian Hockey players, the mean age, height and weight were found to be 24.5 years, 174.1 cm and 60.8 kg respectively.

Orvanova E; (1990) conducted a study to find out the differences in body structure between young and adult weight lifter in ten weight classes, and between weight lifters and non-athletes. Weight lifters in younger age groups differed from the adult one in the parameter, which were correlated with performance results. Weight lifter differed from non-athletes according to weight classes. In lower weight classes, lifter had smaller height, shorter length and widths measurements and the values increased with weight classes. But weight lifters in all weight classes had shorter thighs and forearms and greater arm girths. The length of thighs and forearms can be used as important factors for talent selection.

Bemies (1900) reported the results of the study of five outstanding track athletes. The runners and jumpers were found to be 2" above average in height and with the arm reach an inch longer, with longer legs and also with the lower leg than other persons of the same height. The calf and thighs averaged smaller and the hips an inch narrower. He suggested that these leg proportions gave a quick-acting upper leg a long reach with the lower.

Pere et al. (1954) studied the top ranking track and field athletes and related their various body measurements to their performance. Throwers were tallest in this material and they seemed also to benefit
most from their height. The correlation between the relative upper limb length and performance was significant in throwers and long distance runners. The correlation between the relative shoulder breadth and performance was negative and highly significant in the case of throwers. The correlation between the relative chest circumference and performance was negative and highly significant in the case of sprinters and positive and significant in case of throwers.

Carter (1970) noted 34 white Olympic runners rated by Heath and found all runners uniformly low in the first component. The 800/1500m runners were half a unit higher on Mesomorphy then 5000/10000m runners and marathon runners, whereas the 5000/10000m were half a unit higher on the third component then the other two groups. In his review of Somatotype of athletes, he found the San Diego State and high School runners higher on endomorphy, lower on mesomorphy and slightly higher on ectomorphy than Olympic runners. Olympic runners were 26 year old, but were smaller and lighter than the San Diego runners. The high school runners were shortest and lightest. Apparently, somatotype is a selective factor in distance running at the high school level. Because fat is obviously a handicap in running, the low first- component ratings are not unexpected. The relatively wide range on the second and third components means that more people of suitable height and weight can achieve success at one of the distance runs.

Lewis (1966) studied the Somatotype of ‘A grade’ provincial representatives and national representative basketball players in New Zealand and found that the heights and weights of players at different levels of selection did not differ, nor did the Somatotype rating, except for a decrease in Endomorphy by half a unit at the higher levels of selection.
Hirata (1966) Studied 186 Tokyo Olympic Basketball players who averaged 189.4 cm in height and 84.3 kg in weight. Except the shot putters, they were found to be tallest in his sample of different games, the tallest of the players being 218cm. And lean type was particularly suitable for prompt action, so they had the most suitable physique.

Morris (1960) studied the structural and physical differences between women athletes and unselected college women. Significant differences were found between all strength tests, vital capacity, height, mesomorphy and ectomorphy. There was clear evidence that the total strength and leg length per pound of body weight were important factors in performance than the body weight and strength alone.

De. Garay et al. (1974) conducted a comprehensive study on the Mexico Olympians. Their entire track group had similar Somatotype distributions and were concentrated mainly in the ectomesomorphic category, sixty one percent of their throwers were endomesomorphs the remainders being dominant mesomorphic. On the other hand, the jumpers. Vaulters and decathlon athletes had no dominant endomesomorphy.

The throwers of Mexico Olympic were considerably heavier than the other group of field events. The former had significantly broader shoulders and longer trunk than the latter. The hips of jumpers were narrower than the throwers. Their legs were found to be longer than the javelin throwers.

Westlake (1967) divided 61 female track and field athletes of San Diego Country into four groups on the basis of there best event and somatotyped them using the Heath-Carter (1967) anthropometric method. The mean Somatotype for each group were sprinters 3-3.5-4, jumpers 3-3-4.5, distance runners 3-4-3.5 and throwers 5-4.5-2. Throwers differed
from the other groups in being heavier, more endomorphic more mesomorphic and less ectomorphic. Distance runners were shortest and they were less linear than sprinters and jumpers. High endomorphy and mesomorphy seemed to be assets to throwers, as with male throwers the body mass was important.

Eiben (1972) observed women throwers to be very tall, heavy and muscular. Their longer trunk was accompanied with longer lower extremities. Their upper extremities were only slightly longer than the average of all the women athletes. They excelled with a marked width development, especially at the shoulder. The shot putters had the most muscular extremities among all the women athletes.

The women Discus throwers were the tallest and the heaviest among all the women athletes. Similarly, lengths of their trunk and lower extremities were the greatest. Their lower legs were relatively long and their thighs relatively short. Their upper extremities were long and strong. Characteristically they displayed the longest span with a well-developed shoulder. The muscles of their extremities were highly developed.

The women Javelin throwers weighted least among all the women throwers. They were scarcely taller than the shot putters. As compared with the other women throwers, the development of their width and that of the muscles of their extremities was moderate.

Amar (1920) pointed out that people of small stature were relatively strong as compared with the tall ones and quicker because the weight decreases in proportion to the cube of the size, whereas the force decreases in proportion to the square of the size, being approximately proportional to the cross-section of the muscles. Short heavy-set people are remarkably strong and make good weight lifters, carters and heavy
laborers. The “grasshopper” types with relatively long legs make good jumper, runners vaulter, hurdlers, and agility athletes.

Bramwell & Ellis (1931) worked on 28 marathon runners and compared them with other Olympic athletes. They were found to be older men in the late twenties or in the early thirties, with lighter build and lower resting pulse, and rather higher systolic blood pressure.

J. De rider et. al. (1998) carried out a study on world-class female African athletes. Data were collected on 178 female athletes with a mean age of 21.7 years. The athletes were from 18 countries with Zimbabwe (n = 45), South Africa (n = 38), Namibia (n = 25), Botswana (n = 24) and Zaire (n = 10). The majority of the subjects were black (65.7%) with Caucasians (29.8%) the second largest group. Females from 11 different sports were measured with track and field (n = 52), netball (n = 48), swimming (n = 15) and handball (n = 14). The anthropometrical variables and techniques selected were primarily those described in Carter and Ackland (1994). Data analysis was performed using (Stat Soft, Inc. 1984-1996). Heath – Carter somatotypes were calculated using equations in Carter and Heath (1990). Endomorphy was calculated with a height correction. Results indicate that the average Somatotype for the female athletes (n = 178) was 3.3-3.6-2.8, that was a central Somatotype with slightly more mesomorphy and Endomorphy than ectomorphy. The four-Somatotype categories, to the left of center on the somato-chart (in which endomorphy and mesomorphy combinations were high and ectomorphy was low) accounted for 40.5% of all female athletes. Another 33.1% were in the central and balanced mesomorphy categories, and 26.4% were to
the right of the center in ecto-mesomorphy through balanced mesomorphy categories. Finally, none of the female athletes were in the lower sector of the somato-chart where mesomorphy was lower than both endomorphy and ectomorphy. Somatotype comparisons were made of female athletes in each of the 11 sports by event or by playing position and performance level. Differences in somatotypes were found between events or positions within sport categories. There were for example significant differences between track and field athletes in the 9 different events in the endomorphic ($F = 7.19; p<0.05$), the mesomorphic ($F = 5.42; p<0.5$) as well as the ectomorphic ($F = 4.10; p<0.05$) components.

M. S. Chauhan (2003) carried out a study on prediction of performance of university level throwers in relation to their anthropometrical measurements. The findings of that study lead him to certain conclusions. Age, body weight, height, sitting height, trunk length, leg length, fore-leg length, thigh length, total arm length, upper and forearm length, all have positive and significant correlation with performance of university level throwers. The circumferences i.e. shoulder chest, abdomen, hip, arm and thigh circumferences have significant and positive correlation with the throwing performance. Biacromial, bicristal and elbow diameters possess positive and significant correlation with the performance in throwing event. Among skin fold measurements, biceps, sub scapular, Suprailiac and calfskin folds have positive and significant correlation with performance in throwing event. Body density and lean body mass have negative and significant but fat percentage and fat weight had positive and significant correlation with throwing performance. Multiple correlation of body weight, height and total arm length collectively has significant correlation with the throwing performance.
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The size of multiple correlation is quite sufficient and hence the regression equation can be used for the prediction of throwing performance of university level throwers.

**Sheldon (1940)** Evolved a method for classification of human physique based on a system of three component scale analysis by reference to the development of the three embryonic layers – endoderm, mesoderm and ectoderm. The method is known as Somatotyping. Subsequently, various researchers have tried to modify this method to make it more simple and reliable.

**Tappen (1950)** took Somatotype photographs of 43 of the 57 entrants for the 1947 National Amateur Athletic Union (AAU) weightlifting championship and these were somatotyped by Sheldon and Krogman. Outstanding lifters in all weight classes were measured and had a mean Somatotype 3-6.5-1. These competitors were characterized by very high mesomorphic and low ectomorphic ratings. The ranges of these components were also narrow. On endomorphy, the range was greater, but still low at 3.5 units.

**Dyson (1963)** has propounded that while throwing the discus, the speed of the discus at the moment of release is of prime importance in determining how far it will go, and for given angular velocity (dependent on how fast the thrower does his turn) the speed is proportional to the length of ‘lever’ throwing the discus, i.e. to the distance of the discus from the axis of the thrower; hence the desirability of having long and powerful arms.

**Parvez Shamim (2002)** Carried out a study to ascertain the difference between physical and physiological characteristics of high and
low performance basketball players and found that the high performance basketball players had greater weight, height, sitting height, femur biepicondylar, humerus bi-epicondylar, shoulder breadth, hip breadth, upper arm length, thigh length, lower leg length, biceps muscle girth, calf muscle girth and hip breadth – stature index than low performance basketball players. High performance basketball players had more mesomorphic – ectomorphic rating and have better segmental proportionality than low performance basketball players. There was insignificant difference in Ponderal index, thigh length – lower leg length index, upper arm length – lower leg length index and shoulder breadth – stature index of high and low performance basketball players. High performance basketball players had lower heart rate and greater vital capacity than low performance basketball players. However there was no significant difference in systolic and diastolic blood pressure of high and low performance basketball players.

Mohd. Khalid khan (2005) Carried out a study to ascertain the differences between high and low performance volleyball players in relation to their Anthropometrical and physiological variables and found that the selected National or high level performance volleyball players were taller, heavier in proportion to stature, broader shoulder, wider hip, longer upper and lower extremities then the low performance volleyball players. They had lesser rating of endomorphic and mesomorphic components but a higher rating of ectomorphic component. The fat free mass was also greater in the high performance volleyball players.
Gerhardt Schmolinsky (1983) pointed out that movement in field throws serve to throw or put the implement over as long a distance as possible. In doing this athlete must observe physical laws (e.g. biological and mechanical laws) and general regulations laid down in the International competition rules. Hence the athlete’s performance depends on his ability to tackle environmental factors and on his knowledge of their inherent laws. The better he is familiar with them, the more his movements will be properly directed and efficient.

During the first section the body and the implement are accelerated together and move with the same velocity. The distance between body and implement obtained during the preparation phase should be maintained or only slightly reduced. After this phase the body outpaces the implement and there is at most a slight acceleration. The thrower should therefore strive to keep this section as short as possible. In the shot put, for example, the speed drops to some 0.4m/s during the gliding phase.

After reviewing the literature one reaches to the conclusion that all the sports researchers of the world are engaged in specific research aiming to enhance the sports performance. Either it is anthropometrical or any other sports science field, the aim is to generate some ideas and principles, which must be helpful for breaking the existing barriers of sports performance. The present study is a step in this direction.