Chapter II

REVIEW OF RELATED LITERATURE

The research scholar has made sincere efforts to locate and collect the literature relevant to the study. The related literature collected from different sources has been reviewed in this chapter.

According to Zeigler (1982) measurement of body size includes such descriptive information as height, weight and surface area, while measures of body proportion describe the relationship between height and weight and among lengths, widths and circumferences of various body segments. It has been found that top athletes in some sports tend to have those proportions that biomechanically aid the particular performance required.

Debnath and Bawa (1992) studied the physique, body composition and somatotype of top level Indian female shot putters, discus and javelin throwers and reported that the shot putters were the heaviest and the javelin throwers the lightest in weight and the most ectomorph were among the throwers.
After examining the Montreal Olympic athletes, Carter (1982) and others concluded that jumpers were heavier and had larger thigh and calf girths than the sprinters and distance runners. The long distance runners had smaller upper arm and fore-arm girths than sprinters or jumpers but larger bisiliac breadth than sprinters. They could not find any significant differences in age, height, sitting height, upper extremity length and bisacromial breadth.

In an attempt to develop scientific criteria for the selection of budding athletes based on their morphological status, Kansal (1982) studied 246 male students in the age group of 11 to 17 years. Their height, weight, bisacromial, humerus, bicondylar, chest and calf circumferences and performance in 100 meters running, shot put and standing broad jump were examined. He concluded that the above said body measurements showed significant degree of relationship with individual performance tests studied. Further with the help of these differential role, preparation of selection criteria for choosing budding athletes at a young age was also attempted.

Among field athletes the long, high and triple jumpers, studied by Sodhi and Sidhu (1984) were taller
but lighter in weight with proportionately longer lower extremities and shorter trunk than those of other athletes. However, the Indian athletes were proportionately slender in hip width with narrow bisacromial diameter and smaller chests. They had smaller bicondylar diameter with less of lean tissue as well as the total body fat than other athletes.

Wells and others (1981) after examining the Marathon runners concluded that distance runners are light in build with little body fat and large lung volume.

Linck (1963) studied anthropometric measurements, somatotype ratings and certain motor fitness tests of physical education majors in South Africa. In this study selected Anthropometric Measurements and somato type ratings of Physical Education Majors were studied and their relationship to the performance of certain motor fitness tests was determined to selected anthropometric measurements i.e. height, weight, shoulder width, neck girth and waist girth were taken and few indices were calculated. Sheldon's method was used for somato typing and the items of motor fitness test were 60 yard dash, chinning, dipping, standing vertical jump, standing broad jump and
putting the 16 lbs - shot. The anthropometric data showed a pre-dominant trend towards the athletic type as described by Kretchbrenis. The relationship between the body measurements and the motor fitness tests was found to be low except the relationship between the neck girth and the shot put. The mesomorph trait was the most distinctive feature of the subjects of somato-type. The mesomorphs were superior in all motor fitness tests except in 60 yard dash and the ectomorph excelled the endomorphs in all tests except the shot put.

Kamir and Sidhu (1986) studied the age, height and weight of the Asian Junior Footballers. According to their study short stature seems to have some advantage in football. The relationship of height and weight will be of great significance because light weight as well as short stature are the characteristics of the winning team.

Garitty (1966) in a study involving college women found a general tendency for the subjects classified as mesomorphic ectomorphs to perform in a more efficient manner on Physical Fitness Test. The ecto-endomorph group was consistently low in all test items.

Sinning and Lindberg (1972) after an intensive study on 14 members of college women gymnasts, concluded
that women Gymnasts in comparison to other college women tend to be shorter in structure, lighter in weight, and on other body dimensions tend to be smaller in weight, and on other body dimensions tend to be smaller with the exception of circumference over upper trunk and arm as well as skeletal diameters of the arm.

Malina et al (1971) have reported the female throwers as the tallest and the heaviest with broad shoulders and hips, with large muscles and more body fat among all track and field athletes.

Hirata (1979) reported the age, height and weight of Montreal Olympic female throwers. According to him, female shot putters were the tallest (176.5 cm) and the heaviest among throwers. Discus throwers were little shorter (171.5 cm) and leaner than the shot putters and discus throwers.

Bale (1981), Carter (1981, 1984), and Carter and Yuhasz (1984) have also reported the physique, body composition and somatotype of olympic female throwers.

deGaray et al (1974), investigated the somatotype of 141 women in 18 different sports at Mexico Olympic and reported that shot-discus throwers were more endomorphic, more mesomorphic, and less ectomorphic than all other sportswomen.
Eiben (1981) studied the physique of female throwers of 1966 European championship and reported that shot putters of 1966 European championship weighed much and their stature was tall \((X=170.2\text{ cm})\) and had biaxial width of \((X=40.8\text{ cm})\). The female Javelin throwers weighed least among all female throwers.

deGaray, Levine and Carter (1974) after an intensive study on anthropometric measurements of olympic athletes concluded that top level performance in particular events demands particular types of body size and shape, other aspects being similar. They established strong relationship between the structure of an athlete and specific of an athlete on a specific test (event) in which he excelled. Clear physical proto-type exists for optimal performance at level of olympic.

Muthiah and Venketeswarlu (1973) reported data of Indian track and 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 distance they ran. The jumpers and hurdlers were taller and heavier than sprinters, but were shorter and lighter than throwers. The decathletes were the second heaviest as they are all rounders.
Cureton (1951) reported 22 Track and field champion athletes of the United States and reported typical track men to be light in skeletal framework with longer forelegs relative to thighs, and longer legs relative to the length of the trunk, but were exceedingly 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/bisiliac hip width index was shown to be important for differentiating javelin throwers and gymnasts from other types of athletes. The typical throwers were those with greater arm span/height and greater upper arm length/forearm length. The jumpers, hurdlers and vaulters had relatively great leg length/trunk length and relatively large foreleg length/thigh length.

Westlake (1967) conducted the study on somatotype of female track and field athletes of San Diego College who were divided in four groups on the basis of their best event and somatotyped them using the Heath-Carter anthropometric method. The mean somatotypes 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 linear than sprinters and jumpers. High endomorphy and mesomorphy seemed to be assets to throwers. As with male throwers the body mass was important.

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.

Parnell (1951) worked on University athletic club athletes and found all groups of athletes taller than the controls of the athletes, the javelin throwers, discuss 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.

Eiben (1972) studied 125 women athletes during the European athletic championship. He found that in each anthropological characteristics the sprinters had smaller dimensions than all other women athletes. Their small stature was due mainly to their short trunk. Their lower extremities, especially their thigh, were long as compared with the trunk. The upper extremities less muscular, the lower limb, especially the lower legs were strong with well developed muscles. The hurdlers were strong and muscular. Their stature was almost identical with sprinters. The middle distance runners
were the most linear and slender. They were the shortest and lightest of all measured European women Athletes. Their trunk was longest and narrowest. Between the two groups of jumpers, the women long jumpers were somewhat smaller. Their trunk was longer, and lower extremities shorter than those of the high jumpers. The lower legs of the long jumpers were very long.

deGaray and his associates conducted a comprehensive study on the Mexico Olympians publishing the same in 1974. All their track groups had similar somatotype distributions and were concentrated mainly in the ectomesomorphic category. Sixty-one percent of their throwers were endomesomorphy, the remainders being dominant mesomorphs. On the other hand, the jumpers, vaulters and decathlon athletes had no dominant endomesomorphy.

Parnell (1958) plotted charts of competitions in various track and field events and noted the difference between events. Even though those athletes reached moderate standards of performance.

The outstanding study to date on track and field competitors is Tanner's (1964) in which 137 competitors in Olympic and British Empire and Commonwealth games
were studied. This sample represented a little over a third of all those at Rome who had achieved the Olympic standard. He found that only half the somatotypes in the general population were reflected in the olympic sample which ranged from endomesomorphs through ectomesomorphs to mesoectomorphs. There were marked differences in somatotype distribution among competitors in different events. The discus, javelin and hammer throwers, and shot putters mostly had somato type 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 2-3-5. Among the runners, there was a clear difference between sprinters was 2.5-5.5-3, of the 400 metre runners, 2.5-4.5-4 and of the 1500 metres, 5,000 metres and marathon 2.5-4.4. The 110 metre hurdlers had the same average somatotype as the sprinters and the 400 metre hurdlers the same average as the 400 meter runners. Sprinters were relatively short and very muscular men, compared with middle distance runners. The 110 metre hurdlers were large, long legged sprinters. They were as muscular as the 100 metre men, but without the sprinters short legs.

Carter (1970) noted 34 white olympic runners rated by Heath and found all runners uniformly low in the first component. The 800/1500 m runners were half a
unit higher in mesomorphy than 5000/10,000 m runners and Marathon runners, whereas the 5000/10,000 m were half a unit higher in the third component than the other two groups.

Cureton (1954) tested 55 middle-aged athletic champions and compared them with 400 middle-aged men and with normal young men. The former champions were more mesomorphic (3-5-4), more linear in skeletal build, less fat with wider shoulders, smaller hips and smaller gluteal and abdominal girths. They also had stronger dynamometric strengths and better cardiovascular tests.

In a comparative study of somato type in female gymnasts and distance runners from a college population Berans (1978) concluded that gymnasts were significantly heavier and they had larger humerus and femur diameter than that of distance runners. Gymnasts were also found to be mesomorphy ectomorph while distance runners were balanced ectomorph. Further it was concluded that top gymnasts had a balanced mesomorph somato type while less accomplished gymnasts showed equal mesomorphy and ectomorphy.

Ward and associates, (1979) conducted a study to compare anthropometric measurements between master and first class level olympic weightlifters and to assess if
body segment proportionately contributed performance level. A total of 30 measurements were recorded which included lengths, circumferences, age and centre of gravity position. The results indicated few statistically significant differences between seven first class and three master Olympic weightlifters. The master weight lifters were, however, characterised as being stouter in body type than first class lifters.

In a study on predicting ability in basic modern dance skills through anthropometric and physical fitness measurements, Voll (1979) studied height, weight, sitting height, tibial height and upper leg length of 24 female dancers and concluded that ability in basic modern dance skills could be predicted from selected anthropometric measurements.

Votto, (1977) studied somatotype characteristics of 23 major college football players and concluded that football players were markedly classified as endomesomorphic.

A few studies have reported no correlation with proficiency in sports.

Chetia (1982) conducted a study to find out the relationship of leg-length, thigh-girth, calf-girth and
abdominal strength to standing broad-jump on 44 college male students. The students indicated that there was a significant relationship between standing broad jump and leg length, calf girth, and abdominal strength.

The study conducted by Verma & Chauhan (1986) was to find out the body composition and somato types of the Inter-Varsity Wrestlers. The age group of 19-25 years of 105 wrestlers who took part in the All India Intervarsity wrestling championship held at Kurukshetra University were selected as subjects. The different measurements on the subjects were taken. For determining the body composition skinfold measurements at four different sites biceps, triceps, subscapular and supra-iliac were taken. Physique was evaluated with the help of Heath-Carter (1967) somato typing method. It was concluded that wrestlers exhibit greater mesomorphy than endomorphy and ectomorphy.

Cureton (1941) stated that in general, people with long legs and long arms, and relatively short and small trunks, were physically weak types in long-sustained heavy work, but they might show great speed and endurance at high levels of athletic activity.

Hosler, Morrow. Jr. and Jackson (1978) studied 180 collegiate women volleyball players and concluded that women collegiate volleyball players tend to be
slightly taller, heavier, broader in shoulder and of narrower hips.

Beacke (1964) utilized data from 87 male students of high school to determine the relationship of selected anthropometric and physical performance measures to performance in the running hop-step and jump. He concluded that all the variables as measured in the study should have significant relationship with criterion beyond the .05 level of confidence.

Dutler (1965) concluded that the measures and indices which were significantly larger at the .05 level for good vaulters were tibial height, chest girths, shoulder girth, shoulder width, right grip strength, leg power and speed, iliospinal height, thigh length and shoulder width plus shoulder girth and sitting height.

Read (1968) assessed the Anthropometric and strength characteristics of the high school competitive gymnasts. The upper and lower one-third of a group of gymnasts as determined were used as subjects. Good gymnasts were found to be average. Significantly less than poor gymnasts in measure of standing height, sitting height, iliospinal height, armspan, lower extremity length. Good gymnasts were significantly more ponderous than poor gymnasts and were found to possess a proportional greater chest breadth than chest depth.