Chapter II

REVIEW OF LITERATURES
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When it has been accepted beyond doubt that excellence in sport performance has a beneficial influence on the participant’s body structures, many scientists had started to study systematically the physical structure of the persons in view of discriminating individuals who would be suitable to different sports events by adopting anthropometric techniques.

Several investigators have studied the relationship of morphological, anatomical and structural characteristics with physiological and functional phenomenon. Most of their studies were based on the male athletes of different sportive groups and then, they came to the conclusion that a certain correlation exists between the body build and motor capacity. For a better presentation, the reviews have been made exclusively for the following sports events.

Hockey

Carter (1982), among the 33 male hockey players of the Montreal Olympic Games, found that the players, with the respective mean height and body weight of 176.1 cm and 70.4 kg, did not show much differences with those of the cyclists (height = 177.1 cm and weight = 69.6 Kg). Between these two athlete groups, no significant differences have been observed in the body measurements of sitting height vertex, upper and lower limb lengths, bi-acromial and bi-iliac breadths and also other limb girths including height and body weight. However, the cyclists have lower mean sum skinfold (39.4 mm) than the hockey players (55.1 mm). Carter observed a similar body proportion between the hockey players and the students (non athletes).

In a study of 24 top ranking Indian hockey players, Malhotra et al (1973).
reported that they have an average body height and weight of 172.5 cm and 62.9 kg, respectively. The later data has, therefore, shown that the top ranking players had slightly lower body height with heavier weight (2 kg approx) than the rest group of hockey players. The findings of the Molhotra et al were substantiated by Sodhi and his associates (1974) with similar result. Sodhi and his associates (1990), in another significant study among the Indian and Pakistani hockey players, has observed that the Indian hockey players were comparatively more endomorphic than the Pakistani players. The Pakistani players showed an increased height than those of the Indian players in most of the players of different field playing positions. But the Indian players were found to have wider humerus and femur bi-epicondylar breadth.

Football

Carter (1970), found among the football players of the San Deigo State football team and another 20 IOWA university players that the endo-mesomorph type players had a better advantage of being more excellent performance in playing football. It may also be referred to the Indian football players of university and national level as reported by Sidhu and Wadhan (1974) who found the players to have better developed lean tissue in thigh in relation to that of the upper arm, but being possessed less body fat than the controlled group.

On a sample of the Indian 20 male football players who have represented the Punjab state at National Championship, Sharma and Sukla (1990) reported that the players were significantly higher on stature, height acromion, height radiale, height styliion, height dactylion, height illiospinale, height tibiale, sitting height vertex, bi-acromial breadth, chest girth, thigh girth and calf girth than the hockey players who in turn have higher muscle mass percentage.

Weight Lifting

The physique of the 29 male weight lifters of Bristish Empire and Commonwealth games of 1958 in Cardiff, are somewhat similar with those of the throwers, except their much shorter arms and legs for their height (Tanner 1964). They were short statured as their arms matched with their legs. The shoulder and hip widths had the same proportion to the trunk length. But these
were not broad enough in relation to trunk length. The weight lifters had relatively more muscles in their arms than their calves or thighs. It was also observed that their arm muscles were large in relation to the underlying bone.

Among the Indian weight lifters as reported by Sodhi and Sidhu (1984), they were heavier and short statured with proportionately longer trunk and shorter lower extremities. But they have longer lower extremities. Their hands were also proportionately broader and had well developed lean tissue in the upper arm and in their thigh region. In terms of fat components, they did not show any appreciable difference from the controlled group. From these findings, it was revealed that the Indian weight lifters show a similar trend in body structure and other body features as seen among the international weight lifters. The Indian weight lifters, however, have proportionately longer trunk and longer upper extremities.

Running

Many sports scientists studied on international and national track athletes of different distance runners. In the earlier studies of Sargent (1887), it was found that the sprinters were light in weight, with light but long bones and taller than the middle distance runners (Kaulraush 1928). Cureton (1951), however, found that they were light in skeletal framework with longer foreleg relative to thigh and also having well developed muscles. He pointed out that among men of same physical types, there were great differences in performance.

In the later studies of Parnel (1951), among the athletes of the university athletics club; Tanner (1964), among the athletes of British Empire and Commonwealth Games (1958); Eiben (1972), among the athletes of the European athletic Championship; Mass (1974), among the training athletes of the Mexico Olympic games, and Hirata (1919, 1966), among the participants of Rome, Tokyo, Munich and Montreal, a trend of having short stature with well developed muscles in the lower extremities have been found among the sprinters. However, the sprinters, in most of the later studies found to have short stature, longer thigh with well developed muscles.
Many other studies have revealed that the middle distance runners (400m) were found to be taller than other groups (Tanner 1964; Hirata 1919, 1966; and Mass 1974). Tanner (1964) observed that the MDR had broad shoulder and well developed muscles in the lower extremities. In contrast to this, Mass (1974) observed the middle distance runners to have light, slender and small circumference of body limbs. Among the participants of Rome, Tokyo, Munich and Montreal Olympics, Hirata (1919, 1966) found that as the distance increases, the runners gradually become little taller. Exceptionally, the 400m runners of Munich and Montreal, were found to be the tallest and leanest group.

Eiben 1972 found the mean body weight of the middle and long distance runners to be the lightest among the three groups, but not lighter than the controlled group. According to Tanner (1964), the long distance runners were short in stature, with short legged, narrow shoulder and less development of musculature in the lower extremities.

Among the Indian sprinters and 400m runners, Muthiah and Venketswarlu (1973) found hardly any difference between the two groups, although they were larger in many of the body measurements. The Indian sprinters had greater trunk length, broader shoulder, slender hips and better development of musculo-skeletal tissue in the limb. It has also been pointed out that as the distance increases from 400m to 10,000m, the athletes showed a continuously decreasing trend in many body measurements and musculo-skeletal tissue in the limb. Longer distance runners had less amount of body fat than short distance runners. Thus, decrease in many body measurements concomitantly with increased distance is a similar trend as is observed by Tanner (1964). Kaulraush (1928) also pointed out that the long distance runners were found to be the lightest and the tallest group.

Throwing

The throwers, as a whole, were found to be taller than other athlete groups (Parnel 1951; Telka and his associates 1954; Tanner 1964; Westlake 1967 and Eiben 1972). Tanner (1964) has pointed out that the throwers have longer arms in relation to their legs and moreover they also have broader shoulder and hips.
However, certain variation in stature, weight and other anthropometric measurements have also been observed from among the athletes of the sub-event groups. Discuss throwers were the tallest and the heaviest. The shot putters were the most muscular group of all (Eiben1972).

Muthiah (1973) and Venketswarlu (1973) found among the Indian national throwers that they were also taller and heavier than other athletes. In a similar trend with other studies of international throwers, Sidhu and Wadhan (1974), Sodhi and Sidhu (1984) had also pointed out that the Indian throwers were taller, heavier with large limb circumferences and bi-epicodylar diameter with better developed lean tissue.

Cycling

The physical structure of the cyclists was reported by Carter in 1982 from 18 male Montreal Olympic athletes and he found that they had 177.1cm in height, 69.6 Kg in weight and their mean age was 23 years. These cyclists showed proportionately longer in arm, forearm and foot length and smaller in arm, chest, waist girth and skinfold thickness.

Among the Indian national cyclists, Sodhi and Sidhu (1984) found that the cyclists were heavier and taller than the controlled group. They also had greater body weight, taller stature and bigger trunk measurements than those of the long distance athletes, although, they are smaller than the throwers. In chest and hip width measurements too, they are larger. However, with compare to the jumpers, sprinters, and the middle distance runners, the cyclists had longer trunk length.

From the data of 18 female Indian cyclists, who attended the 44th senior national level championship held at Patiala, Kaur et al (1990) found that the cyclists were heavier in weight than the controlled group. They also possessed less amount of body fat percent and lean body mass percent with mean values of 19.79% and 80.20% respectively, while the controlled group had 24.81% and 73.02% in the respective measures. The cyclists also had significantly well developed lower extremity and this might definitely help them for pedaling up more fast.
Gymnastics

Cureton (1951) worked on the data of 15 Danish gymnasts and pointed out that they were shorter and heavier than the controlled group. Their chest were flexible. The gymnasts of the Mexico games (1968), were also found to be small in size with broad upper part and large circumferences (Mass 1974). But the other breadth measurements below the waist were small for their stature. The gymnasts had short measurements of upper legs and upper arms. Carter (1970) found from among the 5 (five) USSR female gymnasts that they were the shortest in height and lightest in weight, with a mean height of 157.0cm and weight of 53.9 kg which were almost identical with those of the female Olympic gymnasts who had a mean height of 157.0cm and weight of 52.0 kg as reported by Hirata (1966).

Carter (1982) reported again from another 15 female Montreal Olympic gymnasts that they had a mean height of 161.5cm and weight of 50.9kg. They were the smallest in height and weight similar to the findings of Hirata (1966). They had proportionately longer limb segments, wider upper body parts, smaller hip, breadth and limb girths.

Debnath and Bawa (1993), among the national and international woman gymnasts of the Asian games (1986,1991) and the Olympic games (1988), had found that the Indian woman gymnasts team of 1986 was significantly taller. The Indian woman gymnasts of 1991 was significantly older and heavier than their counterparts of the Asian games woman gymnasts of the same year (1986) and even from the Olympic games gymnasts of 1988. Moreover, the Indian team of 1986 were heavier in body weight with a mean of 47.33 kg than those of the Chinese (35.71 kg), Korean (43.33 kg) and Japanese (39.41 kg). In height also, the Indian team members were taller with a mean members height of 157.15 cm than those of the Chinese (144.42 cm), Korean (151.33 cm) and Japanese (150.00 cm) counterparts.

Most of the best Indian gymnasts had a V shaped structure (Sodhi et al 1982). Sarker (1986) also studied the Indian female gymnasts and found that
they were shorter and lighter than the Olympians. However, the Indians had more amount of body fat. It may be said that the feature of short stature, light body weight, shorter upper and lower extremities, broader upper body parts and smaller hip size are the general order of the gymnasts (Carter 1970, 1982, Mass 1974).

Choice of statistical methods for the analysis of various component of data are the important aspect of the study. It seems that the kind of methods, so far adopted in sports research are still limited. Besides, the calculation of mean, standard deviation, coefficient of variation and their respective errors, t test has still be followed as the normal measures for certain bi-variate comparisons (Sharma 1990; Sodhi 1991 and Carter 1982). In case of multivariate comparison, the methods of the Analysis of Variance (ANOVA) has been selected as the most common statistical measure by others (Shaw et al, 1990 and Carter 1982). It could sort out distinctly the mean values into two cluster groups - one as the significant group and another as the non significant group, and that is the advantage of this method. This measure, however, do not indicate the details of the particular sports group responsible for occurring such significant differences. Therefore, Duncan's Multiple Range Test is further selected to enable two spot out the specific means responsible for such significant differences. Sometimes, methods like LSD (Least Significant Difference) are found to apply in certain similar studies, but under the condition that the number of sports events (means) to be compared are limited only within 5 numbers. But the Duncan's test can maintain the scope of errors within a tolerable limit even when the number of sports events are more than 5 (Carter 1982).

A brief account of the land, ethno historical background and sports background of the people of Manipur is followed in the next chapter.