Chapter VII
SUMMARY AND CONCLUSION
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People's interest in the field of games and sports and the performance of an athlete has become a subject matter of importance and national prestige. With the recognition of a number of sports events at the national and international level, organisation of sports competition at various national and international level and Olympic games have been a regular feature. It is now well understood that among numerous factors, which are responsible for the performance of an athlete, the physique which refers to the size, shape and the form of an individual is believed to be the main criterion for a good athlete. Moreover, one's cultural heritage of sports has also been considered to be the important aspect of the performance. Of course, physical exercise and training can improve the performance of an athlete, but ultimately the physical structure are appeared to be the important determinants of the level of performance of the athlete.

Tanner (1977) stated that not only the climatic conditions, which play important role in shaping different body shapes, the human movements, also influence variations in physique and body composition.

Many scientists had started to study the physical structures of the persons in view of choosing individuals, who would be suitable to different sports events. Many investigators have studied the relationship of morphological, anatomical and structural characteristics with physiological and functional phenomenon. Some important studies have revealed that athletes of different sports events
have different physical structures. For instance, Carter (1982) pointed out that
the height and the body weight of the hockey players of the Montreal Olympic
games are, 176.10cm. and 70.4kg. and he said that the hockey players are not
much different from those of the cyclists (height = 177.1cm. and weight=69.6kg.).
On the contrary, from the top ranking Indian hockey players, Malhotra et al (1973)
reported that they have the mean body height of 172.5cm. and weight of 62.9kg.
respectively, which are much lower than those of the Montreal Olympic hockey
players. It has also been observed that the Pakistani hockey players are taller
than the Indian hockey players (Sodhi and his associates 1974), but the Indian
players had wider humerus and femur bi-epicondylar breadth.

The football players, with endo-mesomorph type had more advantage in
playing football (Carter 1982) and they had better developed lean tissue in the
thigh in relation to that of the upper arm and also possessed less body fat (Sidhu
and Wadhan 1974). Sharma and Sukla (1990) found the football players having
higher stature and in many other measurements than those of the hockey players.

In general, the weight lifters have short stature with shorter arms and legs
for their height, although, they have broader shoulder and wider hip (Tanner
1964, Shodi and Sidhu, 1984).

In case of the runners, observations have been made in general that the
short distance runners or the sprinters had short stature with well developed
muscles in the lower extremities (Parmel 1951, Tanner 1964, Eiben 1972 and
Mass 1974). Among the middle distance runners, the 400m runners were found
to be the tallest than other groups (Tanner 1964, Hirata 1919, 1966), while the
long distance runners were short in stature with short leg and narrow shoulder
with less developed musculature in the lower extremities (Tanner 1964).

The throwers were found to be taller than other athletes and they also had
longer arms in relation to their legs (Tanner 1964). The discuss throwers, among
other throwers, were the tallest and heaviest, while the shot putters were the most
muscular group (Eiben 1972, Sidhu and Wadhan 1974).
Among the cyclists, Carter, (1982) found that the Montreal Olympic athletes were 177.1 cm. in height and 69.9 kg. in weight with a mean age of 23. These cyclists also had proportionately longer arm, fore arm and foot length and smaller in arm, chest and waist girth measurements and also skinfold thickness. Kaur et al, (1990) observed among the female Indian cyclists to have heavier in body weight and they also had less body fat % (19.79%) and lean body mass percent (80.20%).

Among all other athletes, the gymnasts are the shortest and the lightest having about 157.0 cm. of height and 53.9 kg. of weight (Carter 1970, Hirata 1966). Furthermore, the Asian gymnasts are still shorter and lighter (Debnath and Bawa 1986). The Indian gymnasts, however, have found to have taller height (157.15 cm.) and heavier weight (47.33 kg.) than their other Asian counterparts.

The anthropometry, which is the system of measuring man and studying the size, shape and proportion has been taken as an important tool for assessing the athlete's performance by many (Sargent 1987, Kaulraush 1928, Cureton 1951, Hirata 1919, Tanner 1964, Carter 1970, Mass 1974 and Carter 1982). The anthropometric measurements reflect information about the various parts of the body, body dimensions, limb girths and skinfold thicknesses etc. Somatotyping is also one of the important aspect of studying human physique which is evaluated from a small number of measurements. However, it has certain limitations because of the fact that two athletes of two sports events may fall into the same somatotypes, although, they may differ in terms of certain body measurements, which play important role in different sports events, therefore, somatotyping method only cannot provide a comprehensive idea for assessing suitable athletes.

The present study has envisaged to examine the variations in the physical structures of the female Meitei athletes of 7 sports events such as hockey, football, weight lifting, running, throwing, cycling and gymnastics and also the controlled group (non athletes). Comparisons have also been made between the athletes and the controlled group and also inter athlete groups of different sports events.
Further, comparisons have also been made among the sub-events of the weight lifting and the running events by using 28 anthropometric variables inclusive of skinfold measurement, body proportion and body composition factors.

The Meitei, which has been chosen for the present study, is one of the chief populations of the state of Manipur. It is a hill girth state and homeland of various ethnic groups and tongues. The total population of Manipur state is 23,88,634 of which 12,07,338 are males and 11,81,296 are females (Govt. of India 2001). It covers an area of 22,356 sq. km. of which 2,230 sq. km. constitute the valley, where the Meiteis live at an altitude of 790m. above the sea level, Manipur enjoy a moderate climate having an average temperature ranging from 4.83°C in the winter and 33.13°C in the summer. The average rainfall of the state is recorded as 1719.99mm (Directorate of Economics and Statistics, Govt. of Manipur 1999).

The people of Manipur largely depend on the agricultural economy, as about 57.83% of the total working force (8,58,667 individuals), are engaged in agriculture and its allied activities. Handloom and handicrafts of Manipur are well known and sericulture has been an old industry of Manipur. The per-capita annual income of the state for the year 2001 is Rs. 12,228/- against Rs. 17,530/- for All India at the current price (Govt. of Manipur, 2002).

The Meiteis speak Meiteilon or Manipuri language. They are the Hindus, but, they still retained their traditional belief of Sanamahi cult-family deity.

The Meiteis had a rich heritage of culture in games and sports. It is claimed that since the time of Pakhangba (33 AD), the Meiteis were trained in warfare skills and also in martial arts. They had evolved various indigenous games such as khongkangjei (khong = foot, kangjei = hockey), sagolkangjei (polo), muknakangjei (combination of wrestling with hockey), yubilakpi (cocoanut snatching), lamchel (race), and throwing events. Besides these outdoor games, many other indoor games such as kangsanaba, likonsanaba, marumkonbi etc. were also some of the indigenous games of Manipur. There are also various games,
which are specially played by the Meitei children. The Meitei girls, specially in their childhood stage, also used to play various minor games such as uraobi, cheitekkotpi, marumkonbi, phibulhabi, nom nom sagaitong etc. They played these outdoor games specially in the evening. Thus the games and sports has been an indispensable part in the life of the Manipuri people since time immemorial (Devi 1988). After the British occupation in the state in 1981, many more foreign games such as hockey, football, cricket, carrom, chess, table tennis, basketball, baseball, shooting, archery, swimming, fencing etc. have become very popular games. Since after the Manipuri girls participated at the 5th national schools games in 1959 held at Bombay, the Meitei girls have taken serious involvement and participation in various games and sports. Many of them, have now attained the national and international levels, specially in the event of football, hockey, cycling weight lifting, boxing, archery and fencing etc.

The necessary data for the present study have been collected from a total of 243 Meitei women individuals of which 143 are the regular playing athletes, while the rest 100 individuals are the non playing controlled group. The sports events, which have been considered for the present study, are 7, such as hockey, football, weight lifting, running, throwing, cycling and gymnastics. The data were collected from various playgrounds of Imphal districts and the stadia of Manipur, where they gathered for their routine practice.

Regarding the controlled group sample of 100 non playing individuals, data have been collected from various colleges and secondary schools of four valley districts such as Imphal east, Imphal west, Thoubal and Bishnupur districts.

The sports events have broadly divided into two categories viz. team pursuit event (hockey and football) and individual pursuit events (weight lifting, running, throwing, cycling and gymnastics). For the weight lifting and running events, further sub-events have been considered for the purpose of studying intra variations amongst them. Two sets of information were collected while collecting the data. The first set consists of information related with personal information
such as age, birth order, family size and family income. The second set consists of 27 anthropometric variables which may be grouped into three classes such as length, breadth measurements, girth measurements and skinfold measurements, besides body weight, were collected following Weiner and Lourie (1969).

Tabulations have been made for the frequency distribution of the age of the individuals, their birth order, family size and per capita monthly income of the athletes and the controlled group. The family income, so collected during the field work, have been assessed and the necessary valuations had been converted following Prosid’s classification (1970). From these anthropometric variables, the body proportion and body composition have also been calculated for each of the athletes and the controlled grouped. For the body proportion, 16 anthropometric variables have been considered for converting into Z values by Z score formula of the Phantom Stratagem method, which was proposed by Ross and Wilson (1974) and revised afterward by Ross and Ward (1982). About the body composition i.e. fat percent, calculation have been made out of the skinfold measurements following Slaughter et al, (1988). From the F%, total body fat(TBF) and lean body mass(LBM) have been calculated.

For each anthropometric measurements, statistical constants such as mean, standard error of mean, standard deviations and co-efficient of variations have been calculated. For certain bi-variate comparisons 't' test have been applied, but for multivariate comparisons, the one way Analysis of Variance (ANOVA) had been applied. If the value of the analysis of variance (F ratio) is found to be significant at 0.05 percent level, a further test known as Duncan’s Multiple Range test for unequal sample size was applied following Walter (1967), so as to enable to locate the mean values responsible for occurring the significant differences.

The analysis of the data has shown that the majority of the Meitei women athletes irrespective of their sports events are belonged to the age group 18-20 years, having with 69.23%. The highest number of athletes belonging to this age group (18-20 years) have been recorded from among the runners with 95.10%,
while the football players show the least in this age group with 50.00%. About 85.00% of the gymnasts and the weight lifters are also belonged to this age group. Exceptionally a number of football players continued to play till their late thirties. The controlled group also show the highest number of individuals in the age group 18-20 years with 67.00%.

Analysis of the birth order of the athletes has revealed that the maximum number of them have been recorded from the 4th and 5th birth orders incidentally with 20.28% in each. About 16-17% of them also belonged to the birth orders 2 and 5. In case of the controlled group, the maximum number of the subjects belonged to the age group 18-20 years (67.00%) and followed by the birth order of 1(26.00%).

It has also been noted that the maximum number of athletes (25.87%) are belonged to the family size having at least 8 members, which is followed by the families having 7 (13.99%) and 6 (11.89%) members. As the family size increases or decreases, the number of the athletes are reduced. Such a pattern has also been obtained among the controlled group.

It is also noteworthy that the highest number of the Meitei women athletes are found from the lower social class IV group with 46.85%, while 31.47% are from the social class V group. Hardly, there are athletes, which have been represented from the class II (0.70%) and the class I groups. There is nothing to be so surprised that even from the controlled group, the maximum number of them (58.00%) have been recorded from the social class IV group.

Analysis of the 28 anthropometric variables, have revealed that among the athletes of the 7 (seven) sports events, the throwers have the highest mean values as much as in 19 variables (BW, HV, HA, HIL, TL, HT, UAL, HL, THL, LLL, LLWF, HB, BAB, BTB, BCB, CG, FAG, CLG and BSF). Next to them, the weight lifters and the cyclists show such highest mean values in only 4 (NG, UAG, THG and TSF) and 3 (SHV, ALWH and FAL) parameters respectively, while the football players show the highest in mean age only. The gymnasts, on
the contrary, have shown the lowest mean values in 23 variables. The runners have even shown such lowest mean values in 1 (HB, BCB, UAG and also in mean age variables. Only in SSF, the controlled group had the highest mean value, when compared with those of the athletes.

In terms of the body proportion of the athletes, the weight lifters have recorded the maximum mean values in 9 variables (BW, HL, BAB, BCB, UAG, CG, THG, CLG and TSF) out of 16. Other athletes, who have shown the maximum mean Z values are 3 (SHV, FAL, UAL) among the cyclists, 2 (THL, FAL) among the throwers and only 1 (LLL) among the runners. Here again, the gymnasts have the lowest mean values in 9 variables, which is followed by that of the runners with 5 variables. The cyclists show the lowest mean value in LLL, while the hockey players show in SHV. In SSF, the controlled group have shown the highest mean Z value.

Not only in body proportion, the weight lifters again have shown the highest mean values in 2 components of F% and TBF, while in both of which, the gymnasts have shown the minimum mean values. The throwers have revealed the highest mean in LBM component. On the contrary, the controlled group have the lowest mean in LBM.

From the distribution of the mean values of the 26 anthropometric variables inclusive of the sum SF among the athletes of the sub-events of the weight lifting, the highest mean values in maximum number of 23 variables, have been observed from among the 76 kg. class weight lifters and they are followed by 64 kg. class group with only 2 variables (FAL and HB). In age, the 46 kg. class group has shown the maximum mean value. Not only in the mean distribution of the anthropometric variables, the 76 kg. class weight lifters have shown the highest mean Z values in 8 variables (BW, UAL, BCB, UAG, CG, THG, TSF and SSF), while the 64 kg. class group have revealed the highest means in only 3 variables (FAL, FAG and CLG). The highest mean Z values have also been found in 1 variable each, among the 59 kg. class (LLL), 54 kg. class group (HL) and 46 kg.
class group (SHV). But the 50 kg. class weight lifters have the highest mean Z values in the two variables (THL and BAB). In body composition also, the highest mean values in two components of TBF and LBM have been found among the 76 kg. class group, while the 59 kg. class group have revealed the highest mean in F%. The lowest mean values of the body proportion variables and the body composition components have been found among the lower weight categories.

Among the athletes of the sub-events of the running, the SDR have shown the highest mean values of anthropometric measurements in 9 variables (CG, NG, UAG, FAG, THG, CLG, BTB, TL and BW). The MDR also show the highest mean values in 8 variables (HV, SHV, FAL, HL, THL, LLWF, BCB and age), while the LDR, in a more or less similar trend of 9 variables (HA, HIL, HT, ALWH, UAL, LLL, HB, BAB and sum SF) have the highest mean values. From the distribution of mean values of the anthropometric variables, it has been found that the SDR are the shortest in height (153.00 cm.) and heaviest in weight (49.80 kg.) and the MDR are the tallest (155.65 cm.) among the three groups, while the LDR are the lightest in weight (47.11 kg.). The lowest mean values have been observed among the SDR in 13 variables, and also among the LDR in 10 variables, while the MDR have the lowest in only 3 variables. In body proportion, the SDR have shown the highest mean proportional Z values in 7 variables of BW, SHV, FAG, UAG, CG, THG and CLG. The LDR also have shown the highest mean values in 6 variables (FAL, UAL, LLL, BAB, TSF and SSF), while the MDR have revealed the least number of variables in only 3 characters (HL, THL and BCB). The lowest mean values have been found in 6 equal number of variables in each among the SDR and MDR, while the LDR have the lowest in only 4 variables. In case of the body composition components, the SDR have shown the highest means in TBF and LBM, while the remaining factor of F% has been observed among the LDR. In this, the MDR show the lowest means in both F% and TBF, while in LBM, the LDR have revealed the lowest mean value.

When the bi-variate comparisons (t - test) have been made between the controlled group and the athletes of the seven sports events in respect of the
anthropometric variables, it has been observed that the controlled group differs significantly in 24 measurements from the throwers, which is followed by the weight lifters in 16 measurements (BW, HV, HA, ALWH, UAL, FAL, HB, BAB, BTB, BCB, CG, NG, UAG, FAG, THG and CLG) as the second highest. With the rest athletes of the sports events of hockey, football, running, cycling and gymnastics, the controlled group shows significant differences from 8-12 measurements. The minimum number of significant differences have been found between the controlled group and the gymnasts.

In terms of body proportion, the controlled group differs significantly from the weight lifters in maximum number of 9 variables (BW, HL, BAB, BCB, FAG, UAG, CG and THG) and from the hockey players in 8 variables (BW, BCB, FAG, UAG, THG, CLG, TSF and SSF). The controlled group still differs in body proportion in 6 variables each from the football players, runners and the cyclists and with the throwers and the gymnasts in 5 and 3 variables, respectively.

In the comparison of the body composition components, of the controlled group and the athletes of the 7 sports events, it has been revealed that the controlled group show significantly different from the weight lifters in TBF and LBM, but from the football players, cyclists and the throwers in only LBM, while from the hockey players in F% and LBM, from the runners in F% and also from the gymnasts in F% and TBF factors.

When the multivariate comparisons in the 26 anthropometric variables, have been made among the athletes of the 7 sports events by applying the formula of the Analysis of Variance, it has been observed that the significant differences have been found in all the variables under consideration. While examining further, such significant variations among the sports event groups with the help of Duncan's test, it has found that the throwers show the highest number of significant differences from the gymnasts in 25 variables except in age, which is followed by the runners in 21 variables, except in HT, LLL, CLG, Sum SF and age. They also differ significantly from the football players (17), weight lifters
(15) and the hockey players (12) mostly in body height measurements, body breadth measurements, limb measurements and FAG. The significant differences in between the throwers and cyclists are only in 7 variables of HV, THL, LLL, LLWF, BAB, BTB and FAG. The throwers have revealed significant differences from all the athletes of the rest 6 sports events in HV, THL, LLWF, BAB and FAG variables in common. Next to the throwers, the weight lifters show significant differences from the gymnasts in maximum number of 13 variables of BW, THL, LLWF, HB, BAB, BTB, CG, NG, UAG, FAG, THG, CLG and Sum SF. They differ significantly from the runners in 9 variables mostly in body dimensional and girth measurements, while from the cyclists, they differ significantly in the same number of 9 variables but mostly of body height measurements, upper limb measurements and of certain girth measurements. The weight lifters differ significantly from the hockey players and football players in 4 variables each, which are mostly of girth measurements.

In the same trend, the cyclists also differ significantly from the gymnasts in 18 variables and from the runners in 9 variables of mostly body height and limb measurements including BW, although, they differ significantly from the hockey and football players in only 5 and 4 variables of some body height and limb measurements. The comparisons of the hockey players, football players and runners with the gymnasts also show significant differences in still a quite high number of variables ranging from 8-12 variables. Strikingly enough, the comparisons among the athletes of the sports events of the hockey, football and the running do not show significant differences in anthropometric measurements, except that the football players are significantly older in age than the runners and the hockey players are significantly larger in HB and BCB than the runners.

The comparisons in terms of 16 variables of body proportion among the athletes of the weight classes of the weight lifting event, it has been found that the weight lifters show significant differences in maximum numbers of variables from each athletes. They differ significantly from the gymnasts in 12 variables of body proportion such as BW, THL, LLL, BAB, BCB, FAG, UAG, CG, THG,
CLG, TSF and SSF. They also differ from the hockey players (9) and runners (8) in mostly of body dimensional variables including BW. From the cyclists also, they differ significantly in 9 variables, which are mostly of the body girth proportions including upper and lower limb variables. In a least number of 6 and 5 variables, which are mostly the body girth proportions including BW, they differ significantly from the football players and the throwers. Next to the weight lifters, the throwers have shown significant differences from the cyclists in 5 variables of SHV, FAL, THL, LLL and FAG and also from the gymnasts in the above same variables, except in FAL. The weight lifters again differ significantly from the football players in THL, FAG and from the hockey players and runners in FAG only. The cyclists in the same way show significant differences in body proportional variables, from the runners and the hockey players in 5 and 4 variables respectively, in which SHV, FAL, THL and LLL, which, are common to both. In least number of 3 and 2 variables, the cyclists differ significantly from the football players and the gymnasts. Comparisons of the runners, hockey players and the football players with the gymnasts show significant differences in a least number ranging from 2-3 variables, and thus suggesting to have closer similarities in terms of their body proportion. It is noteworthy that the athletes of the 3 sports events of the hockey, football and the running events do not show significant differences amongst them in the comparisons of body proportional variables, except the football players and hockey players are significantly larger than the runners in BCB only.

In the comparisons of the body composition components among the athletes of the 7 sports events, the weight lifters differ significantly from the gymnasts in all the three components of F%, TBF and LBM and from the hockey players in F% and TBF, and further also from the runners in TBF and LBM. The throwers also show significant differences from the gymnasts in all the 3 components, from the runners in TBF and LBM, from the football players in LBM. The hockey players also show significant differences from the gymnasts and the runners in LBM. Between the football players and gymnasts, significant differences have been found in F% and TBF.
In the multivariate comparisons of the athletes of the sub-events of the weight lifting in terms of anthropometric variables, by applying the analysis of variance, significant differences have been observed in 15 variables and as such Duncan’s method has further been applied. It has revealed that the 76 kg. class group significantly differ from each of the lower weight categories. They differ significantly from the 50 kg. class group in 15 measurements, which is the maximum. With the 64 kg. class, they differ only in 6 variables of BW, TL, BTB, BCB, CG and THG. In 14 measurements each, the 76 kg. class group differ significantly from both the 46 kg. and 54 kg. groups. The 64 kg. class athletes differ significantly from the 46 kg. and 50 kg. class groups in 11 and 14 measurements, which are mostly of body dimensional and body girth measurements. It has been evident that the least number of significant differences have been observed always in between the nearest weight classes.

In the comparisons of the body proportion variables, among the different weight classes, by the same method of the Analysis of Variance, significant differences have been observed in only 3 variables of BW, BCB and THG. Therefore, Duncan’s test has shown that the 76 kg. class athletes differ significantly from the 54 kg., 50 kg., and 46 kg. class groups in 3 variables each, but from the 59 kg. class group, the 76 kg. class group differ significantly only in 2 variables (BW and THG). The 64 kg. class athletes differ significantly from the 46 kg. class group in all the 3 variables, but from the 59 kg. and 46 kg., they differ in one variable (BCB).

In case of the body composition comparisons also the 76 kg. class group differ significantly from the 46 kg., 50 kg., 54 kg. and 59 kg. class groups in 2 components of TBF and LBM, but with the 64 kg. group such significant differences have been noted only in TBF. In comparison of the 64 kg. class group with other lower categories, the significant differences have been observed only from the 50 kg. and 46 kg. classes in each of TBF and LBM. The 59 kg. class group again have shown significant differences from the 46 kg. and 50 kg. groups in TBF component only.
Strikingly enough, the multivariate measure for comparison of the anthropometric variables among the athletes of the sub-events of the running, significant differences have been evident in only 2 variables of UAG and THG only. Further test has shown that SDR differ significantly from the MDR in UAG and from the LDR in THG only. No single significant differences have been found between the MDR and the LDR.

Following the same trend in the comparison of the body proportion variables, among the 3 group of the runners, the SDR have shown significant differences from the MDR and the LDR in both UAG and THG. Between the MDR and the LDR again, no significant differences have been observed.

In terms of body composition components, the comparison among the athletes of the sub-events of the running, following the method of the analysis of variance, it has been revealed that not a single significant difference has been found, showing characteristics of homogenous compositional types among the 3 group of runners.

When the Meitei women throwers and the gymnasts have been compared in their distribution pattern of the mean age, height, and body weight with some available data of the Indian women throwers and the gymnasts, it has been observed that the Indian women throwers and the gymnasts are taller and heavier than the Meitei athletes. But the Meitei gymnasts are much taller and heavier, when compared with the Chinese women. The Meitei women gymnasts are again found much shorter and lighter from the Montreal Olympic women gymnasts, although, they show much similarity with the Korean gymnasts in height and weight. In case of the runners, the present athletes are shorter but heavier than the Indian runners. In both hockey and football, the Meitei players, in general, are younger in age, shorter in height and lighter in weight than those of the non Indian players. Data for the women athletes of other sports events are scanty.

From the foregoing observations and discussions, the following inferences may be made.

1. Younger age group athletes appear to have more advantages in the game like gymnastics which require more tender and flexible body limbs. This trend has been observed among the Chinese gymnasts
(16.70 years), Korean gymnasts (15.16 years) and the Montreal gymnasts (17.00 years). It may be said that the Meitei gymnasts of the present sample, which has a mean age of 18.57 years may be disadvantageous due to their older age with compare to the international level gymnasts. The same is so with the Indian gymnasts, which has 18.62, as the mean age.

2. The throwers of the present study as revealed by having the highest mean values in maximum number of 19 variables out of the 28 anthropometric variables, is a clear indication of having superior physical structure and physiological characteristics among the athletes of the 7 sports events. Specially by having the highest mean values in body weight (BW), height vertex (HV), height acromion (HA), height illiocrystal (HIL), trunk length (TL), upper arm length (UAL), hand length (HL), thigh length (THL), lower leg length (LLL), leg length without foot (LLWF), bi-acromial breadth (BAB), bi-trochantric breath (BTB), bi-illiacristal breadth (BCB), chest girth (CG), fore arm girth (FAG), calf girth (CLG) etc. with proportionately longer fore arm length (FAL) and thigh length (THL) and also higher LBM component, they have the advantages for effective throwing of the object with greater momentum and velocity to make the object fly higher and covering longer distance. Moreover, their heavier body weight should encounter the opposite and reactive force exerted to the athlete while pushing off the heavy object. Such observations are in conformity with the earlier studies (Tanner 1964, Eiben 1972, Muthiah and Venketswarlu 1973).

3. The present Meitei women weight lifters, who had shown short stature with shorter upper and lower limb measurements, broader bi-acromial breadth (BAB), bi-trocrantric breadth (BTB), and also larger body girth measurements, as well as larger body proportions
including BW are the required physical structure for a weight lifter. The short stature is advantageous to lift the heavy object for a shorter height and moreover, the shorter arms are also helpful for better balancing and keeping the weight closer to the body axis. Comparatively the high mean values of the LBM component and also the TBF and F% are the additional advantageous feature for them. At the same time, they have proportionately the largest fore arm girth, which might give greater strength, in lifting the weight. Such a trend has also been found in earlier studies (Tanner 1964, Sodhi and Sidhu 1984).

Examining further, among the athletes of the different weight classes, the 76 kg class group by having the highest mean stature, heaviest body weight and also the highest mean values in many of the anthropometric variables with compare to the athletes of the other weight classes, is an expected phenomenon. In respect of body proportion, no significant differences have been shown among the different weight class groups except only in body weight (BW), biliocristal breath (BCB) and the thigh girth (THG). In body composition, in general, the higher weight class groups proportionately have higher mean total body fat (TBF) and the lean body mass (LBM) than the lower weight categories.

4. It has been significant to note that the athletes of the 3 sports events of football, hockey and the running have shown maximum homogenous physical structures amongst them, as has been evident from the mean distribution pattern and the statistical comparison of the anthropometric variables, body proportions and also the body compositional factors. Only in LBM, the hockey players have significant difference from the runners. These three group of
athletes have not shown no highest mean values in any of the anthropometric variables, except the football players who have the highest only in mean age. The runners have shown the lowest mean values in HB, BCB and UAG, including the mean age. The athletes of these 3 sports events of hockey, football and running share a common body height of about 154.0 cm (approx). Although, the hockey players have the highest mean weight (52.17Kg) among the three groups, even then, no significant differences have been found from those of the football players and the runners. A few case histories of the players have revealed that some of the athletes did change their options from hockey to football or otherwise, in the earlier part of their sports carrier. Even among the runners, such a case is not an exception.

5. In case of the runners belonging to different 3 sub-events, it has been revealed that the SDR having the highest mean values in body weight (BW), bi-trochanteric breadth (BTB) and also in many body girths and as well as in body proportional variables, had also shown as the shortest in stature and heaviest in body weight. The short stature, heavier body weight with highest amount of LBM are the advantageous feature for a sprinter. Among the MDR, the characteristics of having the highest mean values in stature, upper and lower limb lengths, are the tallest among the 3 categories of runners, while the LDR have the lightest in body weight (BW) of all. But their having broader bi-acromial breadth (BAB), is not the desirable feature for the LDR, according to the previous study (Tanner 1964). But the present LDR athletes, who have small chest girth (CG) is in tune with the aerobic needs for this category of athletes. Statistically, there are no significant differences in anthropometric variables, in body proportion and also in body compositional factors among the 3 groups of runners, except only in upper arm girth (UAG) and thigh girth (THG) in respect of both the characters.
6. The cyclists had observed to have the characteristics of having the second highest stature (155.93 cm) and quite heavy body weight (53.43 kg) with the highest sitting height vertex (SHV) and the longest upper limb lengths in both anthropometric and the body proportional variables according to the trend of Carter (1982). The Cyclists had comparably high mean LBM of the body composition. However, having proportionately the lowest lower leg length (LLL) should be a disadvantageous factor for the cyclists as has been pointed out by Kaur et al (1990).

7. The Meitei women gymnasts, who had the shortest stature, lightest body weight and smaller body parts, are the advantageous body structure for them. In fact, they had the most minimum mean values in all the anthropometric, body proportional and body compositional variables, when compared to other athletes. The lightest body weight with the smallest body size would facilitate the gymnasts in swinging moves and at the creative in. However, the older mean age of the Meitei gymnasts may be considered as one disadvantageous factor. It has already been observed that the Asian gymnasts who have minimum mean stature, body height and younger age are the excellent gymnastic performers.

The findings of the present study has provided the scope to understand the typical physical and physiological characteristics of the athletes of some different sports events of Manipur. It has also been provided an opportunity to analyse: and compare the data of the present study with those of the other athletes of the national and the international level. It may be said that the over all physical structure of the Meitei women athletes representing at least the present few sports events incorporated in the present study, displayed a similar feature with those counterparts of other parts of the country.
Above all, the present study has also provided that an opportunity to examine and verify the effectiveness in the application of anthropometric measurements in the study of physical structure of the athletes of different specialised sports events. The study of anthropometric mean variations, the body proportional and compositional differences, truely provided the detail structural variations between and among the athletes of different sports events. Carter (1982) subscribed the view that such minute structural information of the athletes are more important than the mere suggestion of the morphological type of the athletes, on the basis of similarity and dissimilarity.

It may be suggested that the selection of the players may be done by spotting and choosing the individuals right from their younger age, and by following the strict consideration of the trend and pattern of their growth and development.

It has been evident that the socio-economic background of an individual, specially in the context of Manipur society has not been the main criteria for becoming an athlete. But even then, it may still be suggested that at least adequate fund is necessary to enable themselves to meet the nutritional requirements, and also to strengthen their psychological and moral backup. It is needless to say that an overall infrastructure and training facilities are always the necessary requirements for making the athlete's to reach their optimum performance.

It is certain that the present study would provide valuable scientific data for the athletes of Manipur in general and more specifically for the Meitei women athletes. These information may profitably be utilised for future planning in the field of games and sports in Manipur and of the country as well.