CHAPTER V

SUMMARY, CONCLUSIONS AND SUGGESTIONS

5.1 SUMMARY

Competitive gymnastics has gained tremendous popularity in recent years. More number of spectators and young participants are attracted towards this spectacular sport. Women artistic gymnastics consist of variety of skills on four apparatus (i.e. vaulting table, uneven-parallel bars, balancing beam and floor exercises). Physical attributes necessary for competition success in female gymnasts have significantly changed over the past thirty years. Female artistic gymnasts are reported to be a special group in respect of biological development and performance characteristics when compared with female or male athletes representing some other sports events. In competitive sports every factor has its own bearing on the performance of the player. There are wide varieties of factors that determine athlete’s success: genetics, morphology, mental attitude, motor abilities, physiological abilities, desire, access to training and often money. Morphology of an individual, his level of motor abilities and cardiovascular fitness are the main features which are playing a significant role on sports
performance. Some of us are blessed with more than others. The prerequisites of athletic success in many sports rely to a great extent upon physical characteristics, including anthropometric dimensions, somatotype, and body composition. The player with the right combination of proper physique, physiological and physical abilities will obtain higher level of skill performance.

In the present study an attempt has been made to investigate the relationship of morphological, physiological and motor abilities with performance of female gymnasts.

**Statement of the Problem:**

The present study was designed to find out the relationship of morphological, physiological and motor abilities with performance of female gymnasts.

The problem is stated as:

**RELATIONSHIP OF MORPHOLOGICAL, PHYSIOLOGICAL AND MOTOR ABILITIES WITH PERFORMANCE OF FEMALE GYMNASTS**

**HYPOTHESES:**

The study has been conducted with the following hypotheses:

1. It was hypothesized that there would be significant
relationship between morphological characteristics and performance of female gymnasts.

2. It was hypothesized that there would be significant relationship of motor abilities with performance of female gymnasts.

3. It was further hypothesized that there would be significant relationship of cardiovascular fitness with performance of female gymnasts.

4. It was also hypothesized that there would be significant correlation among the three variables i.e. morphological, cardiovascular fitness and motor abilities.

**OBJECTIVES:**

Present study has been conducted with the following objectives:

1. To find out the correlation of morphological variables with competitive performance of female gymnasts.

2. To observe the correlation of cardiovascular fitness with performance of female gymnasts.

3. To examine the correlation of motor abilities (strength, flexibility and speed) with performance of
female gymnasts.

4. To evaluate the correlation of morphological variables with motor abilities.

5. To find out the correlation of morphological variables with cardiovascular fitness.

6. To study the correlation of cardiovascular fitness with motor abilities.

7. To establish differences between high performance and low performance gymnasts.

**DELIMITATIONS:**

1. The study was delimited to Indian female gymnasts only.

2. The female gymnasts under investigation consist of those gymnasts who took part in All India inter university Gymnastics championship (2008-2009).

3. The age group of female gymnasts was in the range of 18-24 years.

4. The study was delimited to body type and body composition (morphological parameters).
5. The study was further confined to cardiovascular fitness to measure physiological characteristics.

6. The study was delimited to selected motor abilities (four strength tests, three flexibility tests and one speed test).

**LIMITATIONS:**

1. Due to the competition pressure, the gymnasts may not have given their best performance in their selected tests and hence this may be treated as a limitation of the study.

2. Sometimes, the biased judgment by few judges during the competition was considered as the limitation of the study.

**SAMPLE:**

The study was conducted on 94 female gymnasts, who participated in All India inter university Gymnastics Championships held at Patiala in Nov, 2007 and Kurukshetra University Nov, 2008. (Mean age=19.76 years). As the study was based on competitive performance, only those gymnasts who secured more than 20% marks were tested for the investigation. To make the comparison between them, the gymnasts were
divided into two groups on the basis of their performance. The best 24 gymnasts were named high performance gymnasts (Group A) and others were put in low performance gymnasts (Group B).

The following parameters were taken on each female gymnast.

I. Morphological Characteristics

II. Cardiovascular fitness

III. Motor abilities

To get the morphological characteristics, weight, stature, sitting height, subischial length, humerus bicondylar diameter, femur bicondylar diameter, upper arm circumference, upper arm circumference(flexed), fore arm circumference, thigh circumference, calf circumference, hip circumference, biceps skinfold, triceps skinfold, subcapular skinfold, suprailiac skinfold, calf skinfold, sitting height/height ratio, leg length/height ratio, percent body fat and lean body mass percentage and somatotype ratings were recorded on each gymnast.

To measure the cardiovascular fitness of the gymnast, Skubic and Hodgkins (1963) three minute step test was administered.
Sit ups (jack knife action), push ups, chin-ups, standing broad jump, trunk flexion, trunk extension (bridge), side Split (flexibility of hips) and 30 metre sprint tests were selected to measure motor abilities of the gymnast.

The official results of the All India inter university Gymnastics championship was considered as competitive performance of the gymnast.

Zero Order Product moment method of correlation is computed to find out the relationship of variables with competitive performance. The ‘t’ test is applied to know whether the difference between the means of two samples is significant or not at any level of significance. The obtained relationships and differences were tested for significance at .05 level of significance.

5.2 CONCLUSIONS:

1. The analysis of data pertaining to the morphological variables conclude negative and significant correlation of stature and sitting height with competitive performance, whereas, weight exhibits negative but insignificant relationship. Height is negative significantly correlated to the performance
score on uneven bars and floor exercises, weight shows negative significant correlation with floor exercises.

2. With regard to skinfold thickness, biceps, triceps, sub scapular, suprailiac and calf skinfolds are negative significantly correlated with the total gymnastics score, as well as, with the scores of all four apparatus (vaulting table, uneven bars, balancing beam and floor exercises) at 1% level.

3. Percent body fat has negative but significant correlation with total gymnastics score and to all the four apparatus score, whereas, lean body mass percentage demonstrate positive significant correlation.

4. While computing the correlation co-efficient of competitive performance with circumferences, the study concluded that thigh, hip and waist circumferences has negative significant correlations, whereas, calf circumference is positive significantly correlated with gymnastic performance.

5. There is significant relationship of somatotype with
gymnastic performance. The first component (endomorphy) is correlated significantly but negatively, whereas, the second component (mesomorphy) show positive significant correlation with the total performance score, as well as, with all the score of four apparatus. Ectomorphy component do not correlate significantly as the computed value was below the required value of significance.

6. While computing the correlation co-efficient between cardiovascular fitness and competitive performance, the results indicate significant correlation. The computed relationships with all four apparatus score are noticed statistically significant at 1% level.

7. The motor abilities selected for the present study are significantly correlated with gymnastic competitive performance. The selected arm, shoulder, abdomen and leg strength tests (sit ups, push ups, chin ups, standing broad jump) show significant relationship with total performance and apparatus performance.

8. On flexibility variable, all the selected three tests (trunk flexion, trunk extension and flexibility of hips)
are significantly correlated with competitive performance.

9. The analysis of data pertaining to the sprinting ability (30 metre sprint) of the gymnast show significant correlation with gymnastic performance.

10. While computing correlations between strength tests and morphological variables, height is significantly but negatively correlated with sit-ups and push-ups tests.

11. The study show significant negative correlation of skinfold thickness with strength tests.

12. Both endomorphy and mesomorphy components of somatotype are significantly related with all the selected strength tests, whereas, former showed negative correlation; the later has shown positive relationship. Insignificant relationships are noticed between ectomorphy and all the strength tests.

13. There is negative significant correlation of percent body fat with all the four strength tests at 1% level.

14. The correlations of flexibility tests with percent body fat and lean body mass percentage are statistically
significant at .05 level of significance.

15. The present study observes significant relationship of 30 metre sprint with sitting height, triceps skinfold, calf skinfold, thigh circumference and calf circumference.

16. There is significant relationship of leg length/height ratio with 30 metre sprint; it shows that a gymnast with longer legs has taken less time to complete the sprint.

17. There is significant relationship of mesomorphy component with 30 metre sprint.

18. Significant positive correlations of cardiovascular fitness with mesomorphy and negative significant correlations with endomorphy are observed.

19. There is negative relationship between cardiovascular fitness and percent body fat and positive correlation with percent lean body mass.

20. While computing the relationship between motor abilities and cardiovascular fitness, it is concluded that push ups, chin ups, standing broad jump and
trunk flexion variables are significantly correlated with cardiovascular fitness of the gymnast, whereas, hip flexibility and sprinting ability show insignificant relationship.

21. As the comparison were made between high performance and low performance gymnasts, it is concluded that on morphological variables, high performance gymnasts are significantly shorter, possess lesser subcutaneous tissue at the sites of triceps, sub scapular, supra-iliac and calf, has less amount of percent body fat, and more amount of percent lean mass.

22. The high performance gymnasts possess significantly smaller thighs, hip and waist circumferences than the low performance gymnasts.

23. The high performers acquire significantly more values of mesomorphy and low values of endomorphy rating than the low performers.

24. The high performance group is significantly better on all the selected strength tests (sit-ups, push ups, chin ups, standing broad jump) than the low
performance group. All the results are recorded to be statistically significant at 1% level.

25. There are significant differences between high performance and low performance gymnasts on flexibility variable (trunk flexion, trunk extension, side split), as the former possess mere flexibility than the later.

26. The high performers are better on speed test (30 metre sprint) as compared to the low performance gymnasts.

27. The high performance gymnasts possess significantly more cardiovascular fitness as compared to the low performance gymnasts.

**HYPOTHESES TESTING:**

1. Hypothesis No.1 states that there would be significant relationship of morphological characteristics with performance of female gymnasts. This is partially accepted, as all the selected morphological variables do no show significant relationship with competitive gymnastics performance. Height, sitting height, skin folds, thigh,
calf, waist circumferences, percent body fat, endomorphy and mesomorphy components are significantly related with competitive performance, whereas, body weight, leg length, upper arm, fore arm circumferences; humerus, femur diameters and ectomorphy do not show significant relationship.

2. Hypothesis No. 2 states that there would be significant relationship of motor abilities with performance of female gymnasts. This is fully accepted as all the selected motor ability tests (sit ups, push ups, chin ups, standing broad jump, trunk flexion, trunk extension and side split) are significantly correlated with competitive performance.

3. Hypothesis No. 3 states that there would be significant relationship of cardiovascular fitness with performance of female gymnasts. This is also fully accepted as cardiovascular fitness is found to be significantly correlated with the gymnastic performance of present study.
4. Hypotheses No. 4 states that a significant correlation exist among the three variables i.e. morphological characteristics, cardiovascular fitness and motor abilities. This is partially accepted as cardiovascular fitness and all the selected motor ability tests are not significantly related with all the selected morphological variables. Percent body fat, endomorphy component and mesomorphy show significant relationship with cardiovascular fitness and all the selected motor ability tests.

5.3 **SUGGESTIONS FOR FURTHER RESEARCH:**

1. Similar studies should be conducted on lower level performance group such as state, district, college and school level.

2. Similar studies may be conducted on male gymnasts.

3. Studied pertaining to morphology and motor abilities may be conducted on the female athletes of other games and sports.

4. It is suggested that few other variables involving psychological and sociological such as personality, concentration, anxiety, attitude etc. may also be investigated for further studies.
5. Indian female gymnasts may be compared with gymnasts of other advanced countries.

6. Female gymnasts may be compared with other sports women regarding morphological characteristics, cardiovascular fitness and motor abilities.

7. Some other more motor ability variables may be looked into for further investigation.

**SIGNIFICANCE OF THE STUDY**

The results of the study may lead to the understanding of the part played by morphological characteristics, cardiovascular fitness and motor abilities to achieve high performance. The study will help in improving the fitness level for better performance in gymnastics. The study will help the coaches to select the gymnasts at initial level and in formulating training programmed for gymnasts according to their requirements. Gymnasts will come to know their weaknesses regarding physiological and motor abilities.