Chapter V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

The purpose of the study was to investigate the relationship of selected physical and physiological variables to performance in gymnastics and to find out the combined contribution of physical and physiological variables to gymnastic performance besides developing a multiple regression equation for the prediction of performance in gymnastics. The subordinate purpose was to assess the relationship of each of the physical and physiological variable to gymnastic performance when the effects of one of the remaining physical and physiological variables were eliminated.

The subjects were eighty male gymnasts who had participated in the 27th National Gymnastics Championship held at Jabalpur from February 7 to 12, 1984. The dependent variable was gymnastic performance which
was evaluated by a panel of five qualified judges of Gymnastics Federation of India and independent variables were selected physical and physiological variables.

Physical variables selected were Arm strength, Abdominal strength, Right grip strength, Left grip strength, Explosive strength, Speed, Agility, Spine flexibility, Shoulder flexibility, Back and Hamstring muscles flexibility, Dynamic balance, Two hand coordination and Kinesthetic perception which were measured by Rogers PFI, Sit-ups, Grip Dynamometer, Vertical jump, 50 Metres run, Shuttle run, Squat thrust, Flexometer, Rod, Yardstick, Modified Bass Dynamic test, Electrical two hand coordination instrument and Yardstick respectively. Physiological variables included cardio-respiratory endurance, speed of movement, body density, Ryman index and reaction time, which were measured by Cooper's 12 minute run/walk Test, Nelson's Speed of movement test, skinfold calipers, Sphygmomanometer and stethoscope and electronic reaction timer respectively. The reliability of the data was established by using test-retest method. In order to study the
individual relationship of selected physical and physiological variables to gymnastic performance. Pearson's product-moment correlations were computed and to study the combined effects of these variables (separately for physical and physiological variables) to gymnastic performance multiple correlation was calculated whereas further study the individual contribution of each of the selected variables by isolating the effect of one or the other partial correlation were worked out. To test the significance of the relationship the level of significance was fixed at .05.

For the purpose of predicting the gymnastic performance the Regression Equation was formulated.

Analysis of data revealed significant relationships of gymnastic performance to each of the following physical and physiological variables: Right grip strength, \( r = .510 \), Dynamic balance \( r = .449 \), Squat thrust \( r = .450 \), Shoulder flexibility \( r = .373 \), Sit and reach \( r = .365 \), Spine flexibility \( r = .459 \), Arm strength \( r = .370 \), Abdominal strength \( r = .302 \), Left grip strength \( r = .470 \), Explosive leg strength \( r = .397 \),
Cardio-respiratory endurance ($r = .550$), Reaction time ($r = -.505$) and Speed of Movement ($r = .262$). The relationships between Speed, Agility by Shuttle Run, Two Hand coordination, Kinesthetic perception, Crural index, Ponderal index, Body Density and Hyman index to gymnastic performance were not found to be statistically significant at .05 level of confidence.

The analysis of data pertaining to partial correlations showed that Arm strength, Spine flexibility, Dynamic balance, Grip strength both (Right grip strength and Left grip strength), Shoulder flexibility, Explosive strength of the legs, Agility (Squat thrust) and Back and hamstring muscle flexibility were found to have more important bearing on gymnastic performance as compared to Abdominal strength. The Dynamic balance, both Right grip strength and Left grip strength, Agility (Squat thrust) were more significant than Arm strength, as predictors of gymnastic talent. The strength of the Right grip is of greater importance.
as compared to left grip strength. Agility (Squat thrust) has greater relevance than explosive strength of the legs. However the other physical variables are of equal importance in predicting gymnastic performance. Computation of partial correlations pertaining to physiological variables reveals that all the three physiological variables, that is, Cardio-respiratory endurance, Speed of movement and Reaction time have equal importance in predicting gymnastic performance.

Multiple correlation was computed to determine those physical and physiological variables which contributed the most to gymnastic performance. The results of the study show that Right grip strength (1) Dynamic balance (2) Squat thrust (3) Shoulder flexibility (4) Sit and reach (5) Spine flexibility (6) Contributed the most to gymnastic performance ($R_C = 0.123456 = 0.7766$) among physical variables and Cardio-respiratory endurance (1) Reaction time (2) Speed of movement (3) Contributed significantly to gymnastic performance ($R_C = 0.123 = 0.694$) from among the physiological variables.
Multiple regression analysis resulted in the following equations for physical (A) and physiological (B) variables.

\[ Z_C = 0.225z_4 + 0.325z_{12} + 0.236z_9 + 0.239z_{10} + 0.218z_{11} + 0.168z_9 \]

B) \[ Z_C = 0.466z_1 + 0.413z_3 + 0.204z_2 \]

**Conclusions**

Within the limitations of the present study the following conclusions may be drawn:

1) The physical variables namely Arm strength, Abdominal strength, Right Grip Strength, Left grip strength, Explosive leg strength, Agility (Squat thrust), Spine flexibility, Shoulder flexibility, Back and Hamstring muscles flexibility and Dynamic balance are significantly related to performance in gymnastics.

2) Among the physiological variables Cardio-respiratory endurance, Speed of movement and Reaction time are significantly related to performance in gymnastics.
3) The relative anthropometric measurement namely
Crural index and Pondral index are not significantly
related to performance in gymnastics.

4) Speed (50 Metre run), Agility (Shuttle run), Two
Hand coordination, Kinesthetic perception, Body Density
and Hyman index are not found to significantly related
to performance in gymnastics.

5) It is possible to predict gymnastic performance
ability on the basis of physical (Motor ability)/physio-
logical variables.

6) The physical variables namely Arm strength,
Abdominal strength, High grip strength, Left grip strength
Explosive leg strength, Agility (Squat thrust), Spine
flexibility, Shoulder flexibility, Back and Hamstring
muscles flexibility and Dynamic balance have equal
importance in predicting gymnastic performance.

7) The physiological variables namely Cardio-
respiratory endurance, Speed of movement and Reaction
time contribute equally to the performance in gymnastics.
8) Instead of predicting gymnastic performance ability on the basis of each physical and physiological variables separately, the combined effect of physical and physiological variables (should be used making more valid predictions) can be more profitably utilized.

**Recommendations**

6) It is recommended that a similar study may be made in the light of the results of the present study the following recommendation can be made:

1) The result of present study can be useful for the physical education teachers and coaches for screening and selecting potential gymnasts.

2) The findings of this study will help physical education teachers and coaches in systematically preparing their training programme by laying emphasis on the development of those physical and physiological variables which are significantly related to performance in gymnastics.

3) It is recommended that the present study may be repeated by selecting subjects belonging to age groups and achievement levels other than those employed in this study.
4) It is recommended that similar studies may be undertaken with women gymnasts as subjects.

5) Intensive research work may be carried out in other games and sports where the criterion used for measuring success is the game performance.

6) It is recommended that a similar study may be conducted by involving psychological, sociological and functional variables in addition to physical and physiological variables chosen for the present study.