CHAPTER - V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY

A sound training programmes for overall part and structural strength improvement, supplemented with sports - specific exercises like strength training, plyometric training and combination of trainings with specific skill movement training will contribute to improved sports performance. Because the performance of the cricketers is often of utmost importance to the outcome of a cricket match, more efficient and additional sport - specific training methods were sought to develop a new training programme to maximize gains in their range of motion, physical, physiological and psychological parameters.

Cricket is a game that would appear to require little muscular strength. Viewed from a distance, cricket is such a seemingly gentle pursuit that the notion of strength training and exercises would seem to have a limited application. However, as with many sports that involve relatively lengthy periods of low activity punctuated by intervals of extreme muscular focus, cricket is deceptively difficult and it also presents significant physical training challenges for the athlete, especially at an elite level.

For batsmen, bowlers, and fielders, the primary energy system utilized during competition is the anaerobic lactic and alactic processes. In the acts of bowling, batting, and fielding, the intervals of activity requiring energy generation to power the athletes' muscles will almost certainly be fewer than 40 seconds. As all players in cricket are at
some stage of a match called on to bat and field, sound basic fitness training will be a must to all players.

Many research studies have been carried out on the effect of plyometric training and strength training but still the bone of contention is about the varied intensities and frequencies of combination of training with skill movement training to get maximum benefit. Hence, the investigator has made an attempt to study the effects of varied intensities and frequencies of plyometric training, strength training and skill movement training on range of motion, physical, physiological, psychological and performance related variables.

To achieve these purpose 120 cricket players were selected at random and their age ranged between 18 and 24 years. The subjects were segregated into four groups, by adapting random procedure. The investigator did not make an attempt to equate the groups. All the groups served as experimental groups. The experimental group I underwent the sports specific lower body plyometric training and upper body strength training (SSLPUSRT), group II underwent the sports specific upper body plyometric training and lower body strength training (SSUPLST), group III underwent the sports specific plyometric training and strength training (SSPST) and group IV underwent the combination of sports specific plyometric training, strength training with skill movement training (CSSPSSMT).

The influence of various sports specific training methods of plyometric training, strength training and skill movement training and their combinations of training was
assessed on selected range of motion, physical, physiological, psychological and performance related variables.

The following dependent variables were assessed by using standard tests.

1. Range of motion variables

Shoulder elevation through abduction was measured by 360° universal Goniometer and the unit of measurement were in degrees (Clarkson H. et al. 2005).

Thoracolumbar spine rotation was measured by using the measuring tape and the unit of measurement was in centimeters (Clarkson H. et al. 2005).

Ankle planter flexion was assessed by using 180° goniometer and the unit of measurement was in degrees (Clarkson H. et al. 2005).

2. Physical variables

Speed was assessed by 50 meters run (dash) and the unit of measurement was in seconds (Hunsicker and Reiff, 1976).

Agility was assessed by the zig – zag run test (barrow meter ability test) and the unit of measurement was in seconds (Barrow H M, 1954).

Grip strength was measured by using the hand grip dynamometer and the unit of measurement was in kilograms (Ross C H and Rosblal B, 2002).
3. Physiological variables

Measuring maximum oxygen consumption (VO2 Max) was measured by using 3 minutes Queens College step test and the unit of measurement was in ml/kg/min (Mc Ardle W.D et al. 1972).

Anaerobic power was assessed by the Margaria Kalamon Power test and the unit of measurement was in kg/meter/sec. (Margaria R et al. (1966).

Percent body fat was measured by the skin fold caliper and the unit of measurement was in millimeters and thereafter it was converted into body fat using standard procedure. (Hoeger WWK and Hoeger S. A., 1996)

4. Psychological variables

Mental toughness was assessed by the mental toughness questionnaire developed by Dr. Alangoldberg, 1999 and the unit of measurement was in numbers.

Self esteem was assessed by the State Self-Esteem Scale developed by Heatherton and Polivy (1991) and the unit of measurement was in numbers.

Visual reaction time was assessed by the chronoscope test and the unit of measurement was in milliseconds. (Barrow H M et al., 1989)

5. Performance related variables

Cricket ball throwing was assessed by standing cricket ball throw test (Kraemer & Fleck, 1993) and the unit of measurement was in meters.
Running between the wickets was assessed by using the 3 times 505 agility run test (Richard G. Smith et al., 2007) and the unit of measurement was in seconds.

Alternate hand ball catching was assessed by the alternate hand wall ball toss test and the unit of measurement was in numbers (Parameshwaran E.G and Ravichandra K., 2004).

The reliability of data was established by test and retest method.

The subjects were trained 3 days per week at the CMS College of Science and Commerce, Coimbatore. The load was fixed based on the ability of each subject prior to the training. Proper warming up and warm down exercises were given on the days of training. The intensity was increased by 15% constantly every week throughout the training period by adopting overload principle. The experimental groups underwent training for 12 weeks. Subjects were tested on selected dependent variables before the commencement of training and also after the completion of training.

The random group design was used in this study. To test the significant changes made from the baseline to post test on all the groups individually, a t-test was applied. The significance of the means of the obtained test results was tested at 0.05 level of confidence. It was considered sufficient for the present study. The collected data have been processed by using Analysis of covariance (ANCOVA) to determine if there was any significant difference among the treatment means on each variable. When analysis of covariance showed significant differences between treatment means, Scheffe's post hoc test was applied to test the significance of difference between the paired adjusted means.
at 0.05 level of confidence. The data was analyzed by using the SPSS software (11.5
Version) analysis.

5.2 CONCLUSIONS

Based on the results of the study, the following conclusions have been arrived
within the limitations.

1. Twelve weeks of sports specific lower body plyometric training and upper body
strength training, sports specific upper body plyometric training and lower body
strength training, sports specific plyometric training and strength training and
combination of sports specific plyometric training, strength training with skill
movement training significantly improved the range of motion variables of
shoulder elevation through abduction, thoracolumbar spine trunk rotation and
ankle planter flexion.

2. The physical variables such as speed, agility and grip strength improved
significantly due to the influence of twelve weeks of sports specific lower body
plyometric training and upper body strength training, sports specific upper body
plyometric training and lower body strength training, sports specific plyometric
training and strength training and combination of sports specific plyometric
training, strength training with skill movement training.

3. The improvements due to twelve weeks of sports specific lower body plyometric
training and upper body strength training, sports specific upper body plyometric
training and lower body strength training, sports specific plyometric training and
strength training and combination of sports specific plyometric training, strength training with skill movement training over physiological variables of maximum oxygen consumption, anaerobic power and percent body fat were found to be significant.

4. Twelve weeks of sports specific lower body plyometric training and upper body strength training, sports specific upper body plyometric training and lower body strength training, sports specific plyometric training and strength training and combination of sports specific plyometric training, strength training with skill movement training were considered as the most appropriate training to improve psychological variables like mental toughness, self-esteem and visual reaction time.

5. The performance related variables of cricket ball throwing, running between the wickets and alternate hand ball catching improved significantly due to influence of twelve weeks of sports specific lower body plyometric training and upper body strength training, sports specific upper body plyometric training and lower body strength training, sports specific plyometric training and strength training and combination of sports specific plyometric training, strength training with skill movement training.

6. Further, the combination of sports specific plyometric training, strength training with skill movement training was most appropriate training to improve the range of motion, physical, physiological, psychological and performance related variables than the other training groups.
7. Only in the case of range of motion variables, the sports specific upper body plyometric training and lower body strength training improved better than the other two training groups of sports specific lower body plyometric training and upper body strength training and sports specific plyometric training and strength training.

8. The improvements in the case of physical, physiological, psychological and performance related variables the sports specific plyometric training and strength training group showed better results than the sports specific lower body plyometric training and upper body strength training and sports specific upper body plyometric training and lower body strength training groups.

9. The difference in the improvement between sports specific lower body plyometric training and upper body strength training (SSLPUST, Group - I) and sports specific upper body plyometric training and lower body strength training (SSUPLST, Group - II) was found to be significant on shoulder elevation through abduction, thoracolumbar spine trunk rotation, ankle planter flexion, speed, agility, grip strength, mental toughness and cricket ball throwing and the similar improvements were shown in cases of maximum oxygen consumption (VO₂ max), anaerobic power, percent body fat, self esteem, visual reaction time, running between the wickets and alternate hand catching variables.

10. The differences in the improvement between sports specific lower body plyometric training and upper body strength training (SSLPUST, Group - I) and sports specific plyometric training and strength training (SSPST, Group - III)
were found to be significant on shoulder elevation through abduction, thoracolumbar spine trunk rotation, Ankle planter flexion, speed, agility, mental toughness, self esteem, visual reaction time, cricket ball throwing and alternate hand catching variables and the similar improvements were shown in the cases of grip strength, VO₂ max, anaerobic power, percent body fat, and running between the wickets variables.

11. The differences in the improvement between sport specific lower body plyometric training and upper body strength training (SSLPST, Group - I) and combination of sport specific plyometric training, strength training with skill movement training (CSSPSSMT, Group - IV) were found to be significant on shoulder elevation through abduction, thoracolumbar spine trunk rotation, Ankle planter flexion, speed, agility, grip strength, VO₂ max, percent body fat, mental toughness, self esteem, visual reaction time, cricket ball throwing, running between the wickets and alternate hand catching variables and the similar improvements were shown in the case of anaerobic power.

12. The differences in the improvement between sport specific upper body plyometric training and lower body strength training (SSUPLST, Group - II) and sport specific plyometric training and strength training (SSPST, Group - III) were found to be significant on ankle planter flexion, speed, agility, grip strength, VO₂ max, percent body fat, mental toughness, self esteem, visual reaction time and alternate hand catching variables and the similar improvements were shown in the cases of shoulder elevation through abduction, thoracolumbar spine trunk

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rotation, anaerobic power, cricket ball throwing and running between the wickets variables.

13. The differences in the improvement between sports specific upper body plyometric training and lower body strength training (SSPLST, Group - II) and combination of sports specific plyometric training, strength training with skill movement training (CSSPSSMT, Group - IV) were found to be significant on shoulder elevation through abduction, thoracolumbar spine trunk rotation, ankle planter flexion, speed, agility, grip strength, VO$_2$ max, anaerobic power, percent body fat, mental toughness, self esteem, visual reaction time, cricket ball throwing, running between the wickets and alternate hand catching variables.

14. The differences in the improvement between sports specific plyometric training and strength training (SSPST, Group - III) and combination of sports specific plyometric training, strength training with skill movement training (CSSPSSMT, Group - IV) were found to be significant on shoulder elevation through abduction, thoracolumbar spine trunk rotation, Ankle planter flexion, speed, agility, grip strength, VO$_2$ max, percent body fat, self esteem, cricket ball throwing and running between the wickets variables and the similar improvements were observed in the cases of anaerobic power, mental toughness, visual reaction time and alternate hand catching variables.
5.3 RECOMMENDATIONS

The following recommendations have been made based on the results of the present study.

1. The combination of sports specific plyometric training, strength training with skill movement training is the appropriate training method for improving the range of motion, physical, physiological, psychological and performance related variables.

2. Similar study may also be conducted for female cricketers.

3. Similar study may also be conducted for particular games and sports at various levels of participation.

4. Studies of similar nature may also be conducted by changing the dependent variables.

5. Similar study may be conducted using various training methods like concurrent training, contrast training and skill based training by employing more experimental groups.

6. The present study will give an insight to the coaches to frame a training protocol in cricket.

7. The findings of the study would expose the various sport specific and skill movements training and their adaptations associated with development of range of motion, physical, physiological and psychological variables of male cricket players.
8. While combining the skill movement training with their specific training method may be given a change of experience from their usual training schedule.

9. Studies of similar nature may also be conducted by changing the dependent variables.

10. Similar study may be conducted with a change of intensity at volume.

11. Similar studies may be conducted for different age group boys and girls.

12. A similar study may be conducted with a change of training protocol for other games like volleyball, football and etc.,