Chapter V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The philosophy of physical education, and scientific studies suggest, that sports participation leads to good growth and health. Hence it is a point of interest to know the effect of sports participation on late adolescents who participate in sports in comparison to their counterparts (females not participating in any sports).

It is established by the arguments and research references that good health is the base of a sound mind, and a sound mind is the base of better academic achievement. This philosophy and scientific concepts in the modern context, need to be re-evaluated in an academic environment, so that undergraduate programmes in colleges can bring about the required changes and create understanding and realization of the beliefs and values along with the ultimate goals of life.

The above rationale has motivated the research scholar to undertake a study with the following objectives:

a) To compare females participating in different teams and individual sports with those not participating in any sports.
b) To compare groups of females participating and not participating in team sport and individual sport, to realise the differences in their health, growth and academic achievements.

c) The investigator was also interested to understand the interrelationship among growth, health and academic achievement variables for future recommendations and programming.

d) A calendar year of twelve months, having one academic year of ten months approximately undergoes four major seasonal changes. Changes lead to differential impact on the late adolescent females in respect of their growth and health. Hence, the investigator was motivated to compare the selected variables in regard to seasonal changes.

The purpose of the study was to analyse The Effects of Sports Participation in Selected Sports on Growth Health and Academic Achievement Variables of College Females.

The study was delimited to randomly selected students of colleges of University of Delhi with their ages ranging from 17 to 20 years. The study was further delimited to the following selected growth, health and academic achievement variables.
A. Selected growth related variables:

1. Body Weight (kg)
2. Height (cms)
3. Sitting height (cms)
4. Acromian height (cms)
5. Radial height (cms)
6. Trochantarian height (cms)
7. Dextylian height (cms)
8. Tibial height (cms)
9. Foot length (cms)
10. Hand length (cms)
11. Bi-acromial breadth (cms)
12. Bi-illiocristal breadth (cms)
13. Bi-trochantarian breadth (cms)
14. Bi-epicondylar breadth of humerus (cms)
15. Bi-epicondylar breadth of femur (cms)
16. Chest circumference (cms)
17. Hip circumference (cms)
18. Upper-arm circumference (cms)
19. Fore-arm circumference (cms)
20. Thigh circumference (cms)
21. Calf circumference (cms)
22. Biceps skinfold (mm)
23. Triceps skinfold (mm)
24. Subscapular skinfold  (mm)
25. Anterior suprailiac skinfold  (mm)
26. Fore-arm skinfold  (mm)
27. Thigh skinfold  (mm)
28. Calf skinfold  (mm)

B. Selected health related variables:

1. Lean body mass  (kg)
2. Lean body percentage  (%)
3. Fat mass  (kg)
4. Fat percentage  (%)
5. Heart rate  (frequency)
6. Blood – pressure  (hg)
7. Vital capacity  (Lts)
8. Grip strength  (kg)
9. Sit-ups  (frequency)
10. Leg strength  (kg)
11. Back strength  (kg)
12. Standing broad jump  (mts)
13. Flexed arm hang  (seconds)
14. Nine-minute run/walk  (mts)
C. Self-appraisal questionnaire related to health, which included the following components:

1. Sleep and rest
2. Diet and nutrition
3. Work and study
4. Health and hygiene
5. Infection, disease and different biological cycles related to females
6. Sports and recreation
7. Cultural and social.

D. Self-appraisal questionnaire of selected academic achievement related variables:

PART - A

1. Attendance
2. Academic circle
3. Interest / liking
4. Relationship with teacher
5. Better learning
6. Academic performance
7. Improvement in study hours
8. Concentration
9. Memory
10. Motivation to learning
PART B

1. Percentage of marks of last final examination X / XII / Bachelor of Arts / Bachelor of Commerce (Pass) / Political Science Honours / Sociology Honours / Economics Honours / Psychology Honours / Hindi Honours / Bachelor of Commerce Honours / Mathematics Honours / History Honours / English Honours.

2. Percentage of marks of last to last final examination X / XII / Bachelor of Arts / Bachelor of Commerce (Pass) / Political Science Honours / Sociology Honours / Economics Honours / Psychology Honours / Hindi Honours / Bachelor of Commerce Honours / Mathematics Honours / History Honours / English Honours.

3. Percentage difference of above two.

As the subjects for the study were day scholars, certain unknown factors might have had an effect on the result of the study. However, it was assumed that the random selection of these subjects ensured the nullifying of these factors.

The experimental period was of more than one calendar year but less than two calendar years (July to June and July to April) which was considered adequate to study the changes in the selected variables. The duration of undergraduate courses in University of Delhi is three years. Hence, eventhough the investigator wished to continue the experiment she was forced to terminate it before two complete academic calendar years.
It was hypothesised that there may be better growth, health and academic achievement in the subjects who participate in sports than in non-participants.

Two hundred ten female students studying in Jesus and Mary College and Maitreyi College, Chanakyapuri, New Delhi, were selected randomly for the purpose of the present study.

Keeping in view the purpose of the study, the selected womens' colleges being situated adjacent to each other, facilitated the administrative feasibility of conducting the experiment. It is important to mention here that both the selected colleges maintain a very high standard of reputation and quality in all respects, in the University of Delhi as well as in India. Thus they served as models for the data sources of the undertaken experimentation.

Seventy females belonging to individual games / sports (Group I) engaged in playing the activities of badminton, athletics, judo, table tennis, lawn tennis, and seventy females belonging to team games (Group II) engaged in playing the games of hockey, football, volleyball, basketball, cricket and handball, were selected as subjects. Both the groups regularly participated in the respective games / sports, three to six days per week for at least one hour per day. Seventy females (Group III) who did not participate in any games/sports were selected randomly as the sedentary group for the study. The age of the subjects ranged between 17 to 20 years. The details of the distribution of the subjects have been presented in Table 241.
### TABLE 241

Classification of Subjects

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Group</th>
<th>Group Code</th>
<th>Category</th>
<th>Samples</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>GI</td>
<td>IG</td>
<td>Individual Game</td>
<td>70</td>
<td>19</td>
<td>51</td>
</tr>
<tr>
<td>2.</td>
<td>GII</td>
<td>TG</td>
<td>Team-Game</td>
<td>70</td>
<td>12</td>
<td>58</td>
</tr>
<tr>
<td>3.</td>
<td>GIII</td>
<td>SG</td>
<td>Sedentary Group</td>
<td>70</td>
<td>7</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Grand Total</td>
<td>210</td>
<td>38</td>
<td>172</td>
</tr>
</tbody>
</table>

**Note:**
- IG - Subjects participating in individual games
- TG - Subjects participating in team games.
- SG - Subjects not participating in any game/sport i.e. sedentary, served as control group

Based upon the above mentioned justifications, arguments, modern trends, administrative feasibility and availability of the instruments, the scholar selected the following growth related variables for the purpose of the study.

### A. Selected growth related variables

1. Body weight (Kg)
2. Height (Cms)
3. Sitting height (Cms)
4. Acromian height (Cms)
5. Radial height (Cms)
6. Trochantarian height (Cms)
7. Dectylian height (Cms)
8. Tibial height (Cms)
9. Foot length (Cms)
10. Hand length (Cms)
11. Bi-acromial breadth (Cms)
12. Bi-illiocristal breadth (Cms)
13. Bi-trochantarian breadth (Cms)
14. Bi-epicondylar breadth of humerus (Cms)
15. Bi-epicondylar breadth of femur (Cms)

Circumferences

1. Chest (Cms)
2. Hip (Cms)
3. Upper-arm (Cms)
4. Fore-arm (Cms)
5. Thigh (Cms)
6. Calf (Cms)

The following skinfold sites were selected

Skinfolds

1. Biceps (mm)
2. Triceps (mm)
3. Subscapular (mm)
4. Anterior suprailliac (mm)
5. Forearm (mm)
6. Thigh (mm)
7. Calf (mm)
B. Selected health related variables (body composition):

1. Lean body mass (Kg)
2. Lean body percentage (%)
3. Fat mass (Kg)
4. Fat percentage (%)

C. Selected health related variables (Physiological):

1. Heart rate (frequency)
2. Blood pressure (Hg)
3. Vital capacity (lts)

D. Percentage change of selected health related variables (Physiological):

1. Heart rate lying standing (Frequency)
2. Heart rate lying two minutes (Frequency)
3. Systolic lying standing (Hg)
4. Systolic lying two minutes (Hg)
5. Diastolic lying standing (Hg)
6. Diastolic lying two minutes (Hg)
7. Pulse pressure lying standing (Hg)
8. Pulse pressure lying two minutes (Hg)
E. Selected health related variables (Fitness):

1. Grip strength (Kg)
2. Sit ups (frequency)
3. Leg strength (isometric) (Kg)
4. Back strength (isometric) (Kg)
5. Standing broad jump (mts)
6. Flexed arm hang (seconds)
7. Nine minute run / walk (mts)

Besides the above mentioned health related variables, a self-developed, carefully planned and prepared health related questionnaire was also administered so that accurate and valid information pertaining to health status could be obtained. The health questionnaire was drafted and sent for comments to experts in the field of health and physical education namely, Dr. P.K. Pandey, Dr. S. Gangopadhyay, Dr. A.K. Uppal and Dr. T.S. Brar from L.N.I.P.E., Dr. P.M. Chandran from Sports Authority of India, Jawaharlal Nehru Stadium, Dr. J.L. Jain from Delhi University, Delhi, Dr. L.C. Gupta from B.S.F New Delhi. The scholar modified the health questionnaire keeping in mind the suggestions given by the experts and after the final approval of guide and co-guide then administered it to the subjects through direct contact in a face-to-face situation. For obtaining a response to each question, a nine point scale was used. It included the following components:
1. Sleep and rest.
2. Diet and nutrition.
3. Work and study.
5. Infection, disease and different biological cycles related to females.
7. Cultural and social.

F. Selected academic achievement related variables:

A self-developed carefully planned questionnaire of academic achievement was administered to derive information from the students. The scholar drafted the questionnaire with the help of her guide and co-guide after gleaning through the literature available. It was then sent for suggestions and views to experts in the field of academics i.e. Principals of women colleges namely Jesus and Mary College, Gargi College, Maitreyi College, Lady Sri Ram College, Kamla Nehru College, Daulat Ram College, Miranda College and Janaki Devi Mahavidyalaya. These colleges are known to actively participate in sports as a regular routine. After receiving their views and suggestions the scholar reconstructed the questionnaire and after the final approval of her guide and co-guide administered the questionnaire to the subject through direct contact in a face-to-face situation. The academic questionnaire includes the following components:
PART A

1. Attendance
2. Academic circle
3. Interest / liking
4. Relationship with teacher
5. Better learning
6. Academic performance
7. Improvement in study hours
8. Concentration
9. Memory
10. Motivation to learning

PART B

1. Percentage of marks of last final examination of X/ XII/ Bachelor of Arts / Bachelor of Commerce (Pass) / Bachelor of Commerce (Honours) / Sociology Honours / Political Science Honours / Hindi Honours / Mathematics Honours / English Honours / History Honours.

2. Percentage of marks of last to last final examination of X/ XII/ Bachelor of Arts / Bachelor of Commerce (Pass) / Bachelor of Commerce (Honours) / Sociology Honours / Political Science Honours / Hindi Honours / Mathematics Honours / English Honours / History Honours.

3. Present year's percentage of marks.

4. Difference in academic marks between last school and present year college.
G. Percentage change of selected academic achievement variables:

1. Percentage change between last to last year and last year's academic marks (percentage change one).

2. Percentage change between last to last year and present year's academic marks (percentage change two).

3. Percentage change between last year and present year's academic marks (percentage change three).

4. Percentage change between last year school marks minus present year's academic marks (percentage change four).

The sports programme administered to the subjects is given in Table 242.

TABLE 242
Sports Training Programme as Treatment Variable

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Programme</th>
<th>Month</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Sports coaching</td>
<td>Oct to Dec</td>
<td>Coaching of not less than 2½ months in individual and team games.</td>
</tr>
<tr>
<td>3.</td>
<td>Partly competitive and largely recreational</td>
<td>Jan to March</td>
<td>Some tournaments which were postponed, inter class matches in individual and team games, minor games, marching and preparation for sports day, recreation etc.</td>
</tr>
<tr>
<td>4.</td>
<td>No sports. Only academics</td>
<td>April to June</td>
<td>Complete sports transitional period. Preparation and concentration on (academics) annual exams, followed by relaxation, outings, tours etc.</td>
</tr>
</tbody>
</table>
The Random Group Design was adopted for the study because it was considered the most appropriate for the purpose of the investigation. The Random Group Design was adopted because, in the present study, three groups (G1, GII, GIII) were formed of subjects selected randomly. The criteria for distribution of subjects has already been explained in Table 241. All the groups were tested on the same selected variables.

Analysis of Variance was computed. For mean differences between the groups Post – Hoc analysis served the purpose. Control group (G –III) was subjected to only academics. Such a design nullified the effect of academics so that the effect of games / sports programme participation could be studied.

Each subject was tested four times in a year. The testing was performed in the following manner as described in Table 243.
### TABLE 243

**Testing Protocol**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tests</th>
<th>Test Code</th>
<th>Time of Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Test one (Pre-test)</td>
<td>T-1</td>
<td>Before the starting of physical training/conditioning at zero weeks of training (i.e. 3rd or 4th week of July 1996)</td>
</tr>
<tr>
<td>2.</td>
<td>Test two (First post-test)</td>
<td>T-2</td>
<td>At the end of first meso-cycle (M-1) i.e. 3rd and 4th week of October 1996</td>
</tr>
<tr>
<td>3.</td>
<td>Test three (Second post-test)</td>
<td>T-3</td>
<td>At the end of second meso-cycle (M2) i.e. 3rd or 4th week of January 1997</td>
</tr>
<tr>
<td>4.</td>
<td>Test four (Third post-test)</td>
<td>T-4</td>
<td>At the end of third meso-cycle (M-III) i.e. 3rd and 4th week of April 1997</td>
</tr>
<tr>
<td>5.</td>
<td>Test Five (Fourth post-test)</td>
<td>T-5</td>
<td>Before the starting of physical training/conditioning at zero weeks of training (i.e. 3rd or 4th week of July 1997)</td>
</tr>
</tbody>
</table>

The data obtained was analysed by computing the following statistics:

A. Descriptive statistics.
   i) Mean
   ii) Standard Deviation
   iii) Frequency Tabulation
   iv) Range

B. Comparative relationship and inferential statistics.
   i) Product Moment Correlation
   ii) Analysis of Variance
iii) Post-Hoc Analysis of Variance

iv) $X^2$ (Chi-Square)

The hypothesis was tested at 0.05 level of significance.

**Conclusions**

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

1) Individual game players, team game player and sedentary students did not show any significant difference following Test 1, Test 2, Test 3, Test 4 and Test 5 recorded at an interval of two and half months (on an average) with regard to growth related (anthropometric) variables namely, Weight, Height, Sitting height, Acromian height, Radial height, Trochantarian height, Dectylian height, Tibial height, Foot length, Hand length, Bi-acromial breadth, Bi-illiocristal breadth, Bi-trochatarian breadth, Hip circumference, Upper-arm circumference, Calf circumference, Biceps skinfold, Triceps skinfold, Sub-scapular skinfold, Supra-illiac skinfold, Fore-arm skinfold, Thigh skinfold and Calf skinfold.

2) The Bi-epicondylar breadth of humerus in students belonging to individual games, demonstrated is significant differences between Tests 1 and 4, Tests 1 and 5, Tests 2 and 4, Tests 2 and 5, Tests 3 and 5. Students
belonging to team games demonstrated significant differences between Tests 1 and 5, Tests 2 and 5. Sedentary students exhibited significant differences between Tests 1 and 5.

3) In the case of Bi-epicondylar breadth of femur, the students belonging to individual games and team games showed significant differences between Tests 1 and 5, whereas students belonging to sedentary group were not found to be different when compared among the Tests i.e. Test 1, Test 2, Test 3, Test 4 and Test 5.

4) Sedentary group revealed significant differences in Chest and Fore-arm circumference between Tests 1 and 5, whereas students belonging to individual and team games were not found to be different when compared among the tests.

5) The Thigh circumference of team games group was found to be significantly different between Tests 1 and 3, Test 1 and 4, whereas the students belonging to the sedentary group were found to be different between Tests 2 and 5, Tests 3 and 5. Individual games group demonstrated insignificant differences when compared among the tests.

6) Individual games, team games and sedentary groups have not shown any significant difference following Test 1, Test 2, Test 3, Test 4 and Test 5 recorded at interval of two and half months (on an average) with regard
to Health related (body composition) variables namely, Lean body mass, Lean body percentage, Fat mass and Fat percentage.

7) Individual games, team games and sedentary groups did not show significant difference following Test 1, Test 2, Test 3, Test 4 and Test 5 recorded at interval of two and half months with regard to health related (physiological) variables namely Heart-rate lying and Blood-pressure lying pulse-pressure.

8) Team games group demonstrated significant differences in Heart-rate standing between Tests 1 and 5, Tests 4 and 5, whereas students belonging to sedentary group demonstrated significant differences between the Tests 1 and 4. Individual games group was not found to be significantly different when compared among five tests.

9) The Heart rate after two minutes in team games group demonstrated significant differences between Tests 1 and 5. Sedentary group showed significant differences between Tests 1 and 4, while individual games group was not found to be different when compared among the tests.

10) With regard to Blood-pressure lying diastolic, students belonging to individual games demonstrated significant differences between Tests 3 and 4. Team games group showed significant differences between the Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, whereas
sedentary group revealed significant differences between the Tests 1 and 2, Tests 1 and 3, Tests 2 and 4, Tests 2 and 5, Tests 3 and 4, Tests 3 and 5.

11) In Blood-pressure lying systolic the students belonging to individual games exhibited significant differences between Tests 2 and 5, Tests 4 and 5. Students belonging to team games showed significant differences between the Tests 1 and 3, Tests 1 and 5, whereas sedentary students were found to be significantly different between the Tests 1 and 3, Test 2 and 5, Test 3 and 4, Tests 3 and 5.

12) The Blood pressure-standing diastolic in subjects belonging to individual games demonstrated significant difference between Tests 2 and 4. Team games group showed significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, whereas sedentary group exhibited significant differences between Tests 1 and 2, Tests 1 and 3, Tests 2 and 4, Tests 2 and 5, Tests 3 and 4, Tests 3 and 5.

13) In the respect of Blood-pressure standing systolic, individual games group demonstrated significant differences between Tests 2 and 4. Team games group showed significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5 and Tests 2 and 5. Sedentary group exhibited significant differences between Tests 1 and 3, Tests 2 and 4, Tests 3 and 4, Tests 3 and 5.
14) With regard to Blood-pressure diastolic after two minutes, students belonging to individual games group demonstrated significant differences between Tests 2 and 4, Tests 3 and 4. Team games group exhibited significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, whereas sedentary group demonstrated significant differences between Tests 1 and 2, Tests 1 and 3, Tests 2 and 4, Tests 2 and 5, Tests 3 and 4, Tests 3 and 5.

15) With regard to Blood-pressure systolic after two minutes, students belonging to individual games group exhibited significant differences between Tests 2 and 4, Tests 4 and 5. Students belonging to team games demonstrated significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 5, Tests 4 and 5. Sedentary students showed significant differences between Tests 1 and 3, Tests 2 and 3, Tests 3 and 4, Tests 3 and 5.

16) In Blood-pressure pulse pressure after two minutes, the team games group revealed significant differences between Tests 1 and 2 and in Blood-pressure standing pulse-pressure, between Tests 2 and 5 while individual and sedentary group in both the variables were not found to be significantly different when compared among the tests.

17) In respect of Vital capacity, the students belonging to individual games group demonstrated significant differences between Tests 1 and 3,
Tests 1 and 4, Tests 1 and 5 Tests 2 and 3, Tests 2 and 4, Tests 2 and 5, Tests 3 and 4, Tests 3 and 5. Students belonging to team games showed significant differences between Tests 1 and 5, whereas sedentary group was not found to be different while compared among the tests.

18) Individual, team game and sedentary groups students did not show any significant differences following Tests 1, Test 2, Tests 3, Test 4, and Test 5 recorded at an interval of two and half months (on an average) with regard to percentage of change in Health related (physiological) variables namely, Heart-rate lying standing percentage, Systolic lying standing percentage, pulse-pressure lying standing percentage and pulse pressure lying two minutes percentage.

19) With regard to variable Heart rate lying after two minutes percentage, students belonging to individual games showed significant differences between Tests 1 and 3, Tests 1 and 4. Students belonging to team games demonstrated significant differences between Tests 1 and 4, Tests 1 and 5, whereas sedentary group did not show any significant difference.

20) The systolic lying after two minutes percentage in the students belonging to individual games demonstrated significant differences between Tests 1 and 2. Students belonging to sedentary group showed significant differences between Tests 1 and 4, whereas students belonging to team
games were not found to be significantly different when compared among the Tests i.e., Test 1, Test 2, Test 3, Test 4 and Test 5.

21) The Diastolic lying standing percentage in students belonging to individual games demonstrated significant differences between Tests 1 and 5. Students belonging to team games group showed significant differences between Tests 1 and 3, Tests 1 and 5, whereas students belonging to the sedentary group were found to be significantly different between Tests 1 and 3 when compared among the Tests i.e. Test 1, Test 2, Test 3, Test 4 and Test 5.

22) In respect of Diastolic after two minute percentage the team group was found to be significantly different between Tests 1 and 5. Sedentary group demonstrated significant differences between Tests 1 and 3, Tests 3 and 5. Students belonging to individual games group were not found to be different when compared among the tests.

23) Individual, team games and sedentary group did not show any significant difference following Test 1, Test 2, Test 3, Test 4, and Test 5 recorded at an interval of two and half months (on an average) with regard to Grip Strength (left).

24) Individual games group demonstrated significant differences in Grip Strength (right) between Tests 1 and 5. Students belonging to sedentary
group were found to be significantly different between Tests 3 and 5, whereas team games group was not found to be different when compared among the Tests i.e., Test 1, Test 2, Test 3, Test 4 and Test 5.

25) In the case of Sit-ups, students belonging to individual and team-games group demonstrated significant differences in Tests 1 and 5 while students belonging to sedentary group showed significant differences in Test 1 and 3, Tests 1 and 4, Tests 1 and 5.

26) The Leg strength of students belonging to individual games group exhibited significant differences between Tests 1 and 5. The team games group demonstrated significant differences between Tests 2 and 5, Tests 3 and 5, whereas sedentary group was not found to be statistically different when compared among the tests.

27) The Back strength of students belonging to individual, team games and sedentary groups showed significant differences between Tests 2 and 4.

28) With regard to Standing broad jump, students belonging to team games were found to be significantly different between Tests 1 and 3 while individual games and sedentary groups were not found to be significantly different between Tests i.e., Test 1, Test 2, Test 3, Test 4, and Test 5.
29) With regard to Flexed arm hang, students belonging to individual games group showed a significant difference between Tests 1 and 5, students belonging to team games demonstrated significant differences in Tests 1 and 4, Tests 1 and 5, Tests 2 and 4, Tests 2 and 5, Tests 3 and 5, whereas sedentary group demonstrated significant differences in Tests 1 and 5.

30) Students belonging to individual, team and sedentary groups exhibited significant differences between Tests 1 and 5 when compared among Tests i.e., Test 1, Test 2, Test 3, Test 4 and Test 5.

31) Individual and team game players and sedentary students did not show any significant difference following Test 1, Test 2, Test 3, Test 4 and Test 5 recorded at an interval of two and half months (on an average) with regard to health related variables obtained through questionnaire namely, HQ6 (Weight/diet control), HQ15 (Indulging in smoking), HQ16 (Indulging in alcoholism), HQ18 (Consuming eatables exposed to dust and flies), HQ31(Treatment from quack), HQ32(Treatment from family doctor), HQ33 (No treatment during sickness) and HQ35(No. of hours of rest in day time.)

32) With regard to HQ1 (Satisfaction with sleep and rest) students belonging to team games demonstrated significant difference between Tests 1 and 5. The sedentary group showed significant differences between Tests 2
and 4, Tests 3 and 4, whereas individual games group was not found to
be different when compared among the tests.

33) With regard to HQ2 (Sound sleep) students belonging to team games
demonstrated significant difference between Tests 1 and 5. Sedentary
group exhibited significant difference between Tests 1 and 4 Tests 2 and
4, Tests 3 and 4, Tests 4 and 5, whereas individual games group was not
found to be different when compared among the tests.

34) In the case of HQ3 (Disturbance in sleep with vague fear / anxiety / and/
or bad dreams), students belonging to team games showed significant
difference between Tests 3 and 5. Sedentary group demonstrated
significant differences between Tests 1 and 4, Tests 2 and 4, Tests 3 and
4, Tests 4 and 5, whereas individual games group was not found to be
different when compared among the tests.

35) In variable HQ4 (Intake of sufficient nutritional diet), the students
belonging to team games demonstrated significant difference in the Tests
1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 2 and 5, Tests 3 and 5,
Tests 4 and 5. Sedentary group exhibited significant differences in the
Tests 1 and 2, Tests 1 and 3, Tests 1 and 5, Tests 2 and 4, Test 3 and 4,
Tests 4 and 5, whereas individual games group was not found to be
different when compared among the tests.
36) With regard to variable HQ5 (Concerned about diet), students belonging to individual games group demonstrated significant differences between Tests 1 and 5. Students belonging to team games group revealed significant differences between Tests 1 and 5, Tests 4 and 5. The sedentary group demonstrated significant differences between Tests 3 and 4, Tests 4 and 5.

37) In variable HQ7 (Regular / moderate / hard physical work), students belonging to individual games group showed significant differences between Tests 2 and 3, Tests 2 and 4, Tests 4 and 5. Students belonging to team games demonstrated significant differences between Tests 1 and 2, Tests 1 and 4, Tests 2 and 3, Tests 2 and 4, Tests 3 and 4, Tests 3 and 5, Tests 4 and 5. The sedentary group showed significant differences between Tests 4 and 5.

38) In the case of variable HQ8 (Regular/ moderate / exercise), students belonging to team games group demonstrated significant differences in Tests 1 and 5, Tests 3 and 5, Tests 4 and 5. The sedentary group showed significant differences in Tests 4 and 5, whereas individual games group was not found to be different when compared among the Tests i.e. Test1, Test2, Test3, Test4, and Test 5.

39) In respect of variable HQ9 (Improvement upon study), students belonging to individual games group exhibited differences between Tests 1 and 3,
Tests 1 and 4, Tests 1 and 5, Tests 2 and 4, Tests 4 and 5. Students belonging to team games group demonstrated significant differences in Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 4, Tests 3 and 4, Tests 4 and 5. The sedentary group demonstrated significant differences between Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 4, Tests 3 and 4, Tests 4 and 5.

40) With regard to HQ10 (Improvement in health), individual games group showed significance differences in Tests 1 and 2, Tests 1 and 4, Tests 1 and 5. The team games group demonstrated significant differences in Tests 1 and 4, Tests 1 and 5, Tests 2 and 5, Tests 3 and 5 and Tests 4 and 5, while sedentary group revealed significant differences in the Tests 1 and 5.

41) In the variables HQ11 (Personal hygiene), the students belonging to team games group exhibited significant difference in Tests 1 and 2, Tests 1 and 5, Tests 4 and 5. Sedentary students demonstrated significant differences in Tests 1 and 5, Tests 4 and 5, whereas individual games group was not found to be significantly different when compared among the tests.

42) In the case of variables HQ12 (Cutting and cleaning nails regularly), students belonging to individual games demonstrated significant differences between Tests 1 and 2, Tests 2 and 4, and Tests 4 and 5,
whereas students belonging to team games and sedentary group were not found to be different when compared among the tests.

43) In respect of HQ13 (Caring for proper ventilation, study light, correct postures, regular medical check-up etc.) students belonging to individual games demonstrated significant differences in Tests 1 and 5. The team games group showed significant differences in Tests 1 and 5, Tests 4 and 5. The sedentary students demonstrated significant differences in Tests 3 and 4, Tests 4 and 5.

44) With regard to HQ14 (Regular movements), students belonging to team games exhibited significant differences between Tests 1 and 5, Tests 2 and 4, Tests 4 and 5. The sedentary group showed significant differences between Tests 3 and 4, Tests 4 and 5, whereas individual games group was not found to be significantly different when compared among the tests.

45) In HQ17 (Concentration on work), the students belonging to individual games group demonstrated significant differences in Tests 1 and 5, whereas students belonging to team games group showed significant differences in Tests 1 and 5, Tests 3 and 5. The sedentary group revealed significant difference in Tests 1 and 5.

46) The individual games group demonstrated significant differences in HQ19 (Avoid mental stress and trying to remain cheerful) between Tests 1 and 5, Tests 4 and 5. The team games group showed significant differences
in Tests 2 and 4, Tests 4 and 5, whereas sedentary group was not found to be different when compared among the tests.

47) In HQ20 (Mixing with people and sharing feelings), students belonging to team games group exhibited significant differences between Tests 1 and 5. The sedentary group demonstrated significant differences between Tests 1 and 5, whereas the individual games group was not found to be different when compared among the tests.

48) In the case of HQ21 (Prone to infections/diseases), students belonging to team games group demonstrated significant difference between Tests 3 and 5 and sedentary group showed significant differences between the Tests 1 and 5, Tests 4 and 5. The individual games group was not found to be different when compared among the Tests i.e., Test 1, Test 2, Test 3, Test 4 and Test 5.

49) With respect to HQ22 (Regular biological cycles), students belonging to team games group demonstrated significant differences between Tests 3 and 5. Sedentary group showed significant differences between Tests 1 and 2, while the individual games group was not found to be different when compared among the five tests.

50) With regard to variable HQ23 (Enjoying sports and recreation), the students belonging to individual games demonstrated significant differences in Tests 1 and 2, Tests 2 and 4, Tests 4 and 5. The students belonging to team games exhibited significant differences in Tests 1 and
4, Tests 2 and 4, Tests 3 and 4, Tests 4 and 5. In the case of sedentary group, significant differences between Tests 1 and 3 and Tests 1 and 5 were observed.

51) With regard to variable HQ24 (Participation in recreational activities and sports) the students belonging to individual games group demonstrated significant differences in Tests 1 and 2, Tests 1 and 5, Tests 2 and 4, Tests 4 and 5. Students belonging to team games group showed significant differences in Tests 1 and 2, Tests 2 and 3, Tests 2 and 4, Tests 3 and 5, Tests 4 and 5, whereas sedentary group demonstrated significant differences in Tests 1 and 3 only.

52) In HQ 25 (Considering sports as a good past time), students belonging to team games group demonstrated significant differences between Tests 2 and 4. Sedentary group exhibited significant differences between Tests 4 and 5, while individual games group was not found to be different when compared among the five tests i.e., Test 1, Test 2, Test 3, Test 4, Test 5.

53) With regard to variable HQ26 (Outings with college-mates and friends), students belonging to individual games group demonstrated significant differences in Tests 1 and 2, Tests 1 and 5, Tests 2 and 4. Students belonging to team games demonstrated significant difference in Tests 1 and 2, Tests 1 and 4, Tests 2 and 3, Tests 2 and 4, Tests 4 and 5. The
sedentary group revealed significant differences in Tests 1 and 3, Tests 2 and 4, Tests 3 and 4, Tests 4 and 5.

54) In HQ27 (Non participation in religious functions), students belonging to team games group showed significant differences in Tests 1 and 3. The sedentary group exhibited significant differences in Tests 1 and 2 and Tests 2 and 4, whereas individual games group was not found to be different when compared among the tests.

55) In the variables HQ28 (Participation in social functions), students belonging to individual games demonstrated significant difference between Tests 1 and 5. Team games group showed significant difference between Test 2 and 4. The sedentary group revealed significant differences between Tests 3 and 4, Tests 4 and 5.

56) In the case of HQ29 (Participation in religious functions), students belonging to individual games group demonstrated significant differences in Tests 1 and 5. The team games exhibited significant differences between Tests 1 and 5, Tests 2 and 3, Tests 3 and 5, Tests 4 and 5, while the sedentary group showed significant differences in Tests 1 and 3, Tests 1 and 5, Tests 3 and 4.

57) In variable HQ30 (Worshipping in Temple, Gurudwara, Mosque, Church etc.) students belonging to individual games group demonstrated
significant differences in Tests 1 and 4, Tests 1 and 5. Team games
group showed significant differences between the Tests 1 and 2. The
sedentary group demonstrated significant differences between Tests 1
and 2, Tests 1 and 3, Tests 1 and 5.

58) In the case of variable HQ34 (No. of hours of sleep), students belonging
to team games group demonstrated significant differences between
Tests 1 and 4. The sedentary group showed significant differences
between Tests 1 and 4, Tests 2 and 4, whereas the individual games
group was not found to be different when compared among the tests.

59) In HQ36 (No. of meals per day) the sedentary group demonstrated
significant differences between the Tests 2 and 3, Tests 3 and 4; in HQ37
(No. of fasts/skipping meals per day) between Tests 1 and 3, Tests 2
and 3, Tests 3 and 4, Tests 3 and 5, while students belonging to
individual and team games group were not found to be different when
compared among the tests.

60) In HQ 38 (No. of hours devoted for study), students belonging to
individual games group demonstrated significant differences in Tests 1
and 3, Tests 1 and 4, Tests 2 and 3, Tests 2 and 4, Tests 3 and 4, Tests
3 and 5, Tests 4 and 5. Students belonging to team games group
exhibited significant differences in Tests 1 and 2, Tests 1 and 3, Tests 1
and 4, Tests 1 and 5, Tests 2 and 3, Tests 2 and 4, Tests 3 and 4, Tests
3 and 5, Tests 4 and 5, whereas sedentary group showed significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 3, Tests 2 and 4, Tests 3 and 4, Tests 3 and 5, Tests 4 and 5.

61) With respect to HQ 39 (No. of hours of moderate work), students belonging to individual games group exhibited significant differences between Tests 1 and 4, Tests 2 and 4, Tests 3 and 4, Tests 4 and 5. Students belonging to team games group demonstrated significant differences in Tests 1 and 3, Tests 1 and 4, Tests 2 and 3, Tests 2 and 4, Tests 3 and 4, Tests 3 and 5, Tests 4 and 5, whereas sedentary group showed significant differences between Tests 1 and 3, Tests 1 and 4, Tests 2 and 4, Tests 3 and 4, Tests 4 and 5.

62) With regard to variable AQ1 (Attendance), students belonging to individual games group demonstrated significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 3 and 5, Tests 4 and 5. The students belonging to team games group showed significant differences between the Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, whereas students belonging to sedentary group demonstrated significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 3, Tests 2 and 4, Tests 3
and 4, Tests 3 and 5 when compared among the Tests i.e., Test 1, Test 2, Test 3, Test 4 and Test 5.

63) In the case of AQ 2 (Academic circle), students belonging to individual games group demonstrated significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 4. Students belonging to team games group showed significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 4, Tests 4 and 5, whereas students belonging to sedentary group exhibited significant differences in Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 4.

64) In AQ 3 (Interest / liking), students belonging to individual games group demonstrated significant differences between Tests 1 and 3, Tests 1 and 4, Tests 1 and 5. Students belonging to team games group revealed significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 4, whereas students belonging to sedentary group demonstrated significant differences in Tests 1 and 2, Tests 1 and 3, Tests 1 and 5.

65) With regard to variable AQ4 (Relationship with teachers), students belonging to individual games group demonstrated significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4. The students belonging to team games group demonstrated significant differences
between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 4, whereas students belonging to sedentary group showed significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5 when compared among five tests.

66) In the case of variable AQ5 (Better learning), students belonging to individual games group demonstrated significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5. The students belonging to team games group exhibited significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 3 and 4, whereas students belonging to sedentary group revealed significant differences between Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 3, Tests 2 and 4.

67) With regard to variables AQ6 (Academic Performance), students belonging to individual games group demonstrated significant differences between Tests 1 and 3, Tests 1 and 4, Tests 1 and 5. The students belonging to team games group showed significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, whereas students belonging to sedentary group exhibited significant difference in Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 3, Tests 2 and 4, Tests 4 and 5.
68) In AQ7 (Improvement in study hours), students belonging to individual games group demonstrated significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 3, Tests 2 and 4, Tests 3 and 4, Tests 4 and 5. The students belonging to team games showed significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 3, Tests 2 and 4, Tests 3 and 4, Tests 3 and 5, Tests 4 and 5, whereas students belonging to sedentary group exhibited significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 3, Tests 2 and 4, Tests 3 and 4, Tests 4 and 5.

69) With regard to variable AQ 8 (Concentration), students belonging to individual games group demonstrated significant differences between Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 3, Tests 2 and 4, Tests 3 and 4, Tests 4 and 5. The students belonging to team games group showed significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 3, Tests 2 and 4, Tests 3 and 5, Tests 4 and 5, whereas students belonging to sedentary group exhibited significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 3, Tests 2 and 4, Tests 3 and 4, Tests 4 and 5.
70) In variable AQ9 (Memory) students belonging to individual, team and sedentary group demonstrated significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 4 when compared among five tests i.e. Test 1, Test 2, Test 3, Test 4 and Test 5.

71) In respect of AQ 10 (Motivation to learning), students belonging to individual games group demonstrated significant differences between Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 4. Students belonging to team games group revealed significant differences between Tests 1 and 2, Tests 1 and 3, Tests 1 and 4, Tests 1 and 5 and Tests 2 and 4, whereas in sedentary group differences in Tests 1 and 3, Tests 1 and 4, Tests 1 and 5, Tests 2 and 3, Tests 2 and 4 and Tests 4 and 5 were found statistically significant.

72) No significant differences were observed among the students belonging to individual games, team games, and sedentary groups in Last year's academic percentage marks in 1996-97, and academic percentage of marks last to last year in 1997-98. No inter group differences were observed among the groups when percentage differences were computed from the last school and present college academic achievements (percentage).

73) In the case of last year's academic percentage of marks in 1997-98 and present year's academic percentage of marks in 1996-97, significant
differences were observed between individual and sedentary group, team and sedentary groups; whereas individual and team games group revealed insignificant differences.

74) With regard to last to last year's academic percentage of marks in 1996-97, significant differences were exhibited between team games group and sedentary group, whereas differences between individual and team games group, and individual and sedentary group, were statistically insignificant.

75) In respect of present year's academic percentage of marks in 1997-98, significant differences were demonstrated between individual and team games group and between team games group and sedentary group, whereas individual games group and sedentary group revealed insignificant differences.

Sports girls were better academic achievers in the transition from school to college education in which the sports-persons belonging to individual sports were superior to sports girls of team games.

76) Individual games, team games and sedentary group did not show any significant differences following Test 1, Test 2, Test 3, Test 4 and Test 5 recorded within two and half months (on an average), with regard to
percentage change of academic marks two and percentage change of academic marks four.

77) In percentage change of academic marks one and percentage change of academic marks three, significant differences were demonstrated between comparison of individual games and sedentary group, and team games and sedentary group, whereas differences among individual and team games group were found insignificant.

78) Individual games, team games and sedentary group did not show any significant differences following Test 1, Test 2, Test 3, Test 4 and Test 5 recorded at interval of two and half months (on an average) with regard to health related variables (obtained through questionnaire) namely, Diseases n HQ 40 (a: Diptheria), HQ40 (b :Cholera) and sickness in HQ 42 (g: Blood stained leucorrhoea).

79) Significant differences were exhibited between the inter group comparisons in case of Diseases in HQ 40 (c: Typhoid), HQ 40 (d: Malaria), HQ 40 (e : Jaundice), HQ 40 (f : any other) and in HQ 41 (a: Frequent cough and cold), HQ 41 (b : Frequent fever), HQ 41 (c : Diarrhoea /Constipation); in Infections namely HQ42 (a: Pain or cramps during menses), HQ 42 (b :Profuse bleeding during menses), HQ 42 (c: Menses lasting more than seven days), HQ 42 (d: Irregular menses), HQ42 (e: Inter-menstrual bleeding i.e. bleeding between the menstrual
periods), HQ 42 (f: white discharge in excess), in HQ 42 (h: Backache during menses), HQ 42 (i: Any other problem) and HQ 42 (f: No. problem).

80) Significant differences were observed in all five Tests in individual, team and sedentary groups during inter disease comparisons in respect of diseases in HQ 40; sickness in HQ 41 and Infections in HQ 42.

**Recommendations**

In the light of the conclusions drawn, the following recommendations are made:

1) Directors of physical education, and sports officers working in colleges, should encourage their students to regularly participate in physical education, coaching programmes so as to bring about the desired changes in anthropometric measurements, physiological variables, motor components, health status and academic achievement.

2) In order to judge the effectiveness of physical education, coaching programmes, the students should be subjected to repeated tests, and examinations be conducted at regular intervals. This arrangement of evaluation will facilitate modifications in the physical education, coaching programmes in case desired results are not achieved.
3) In addition to laying stress on academics, colleges should organize a systematic programme of physical education for their students so as to ensure harmonious development of their personality.

4) The present study may be replicated with subjects of sex and ages other than those employed in the study.

5) The present study may be repeated by studying the effect of regular participation in physical education programme by selecting variables not included in the present investigation namely psychological variables, sociological variables etc.

6) The present study may be undertaken with students studying in medical and engineering colleges in order to study the effect of regular sports participation on their academic achievement and other related variables.

7) The present study may be repeated by administering different types of programmes so as to study their comparative effect on specific variables.

8) A longitudinal study may be undertaken with children studying in primary schools, in order to study changes in their growth pattern as a result of participation in physical education activities.