CHAPTER V
SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS
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SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The public health burden of lifestyle-related diseases worldwide countries is high. The most common causes of morbidity and mortality are coronary heart disease, stroke, obesity, allergies and several cancers. A sedentary lifestyle is a major risk factor for these diseases and is close to overtaking tobacco as the leading cause of preventable death (Mokdad et al., 2004). The protective effect of intentional physical activity on the above mentioned non-communicable diseases has been widely reported in people of all ages (Strong et al., 2005; Jonker et al., 2006). Health related Physical fitness refers to the full range of physical qualities, i.e. cardio respiratory fitness, muscular strength, speed of movement, agility, coordination, and flexibility. It can be understood as an integrated measurement of all functions (skeletomuscular, cardio-respiratory, haematocirculatory, psycho-neurological and endocrine–metabolic) and structures involved in the performance of physical activity and/or physical exercise (Castillo Garzon et al., 2005).

Cardio-respiratory function is one of the most important components of health related physical fitness. Cardio-respiratory function reflects the overall capacity of the cardio-vascular and respiratory system and the ability to carry out prolonged strenuous exercise. Hence, cardio-respiratory function has been considered a direct measure of the physiological status of the person. Cardio-respiratory function, cardio-vascular fitness, cardio-respiratory endurance, aerobic fitness, aerobic capacity, aerobic power, maximal aerobic power, aerobic work capacity, physical work capacity and maximal oxygen consumption (VO2max) all refer to the same concept and are used interchangeably in the literature.

Body composition refers to the amount of muscles, bones, and fat tissue that make up your body. One of the keys for having a healthy body is to have a good balance between the amount of muscle and fat tissue in the body. Having too much body fat puts an extra demand on the heart and the joints. On the other hand, having too little body fat is not healthy either. People need body fat to protect their organs, insulate the body and to have as a stored
source of energy. Obesity is present when total body weight is more than 25 percent fat in boys and more than 32 percent fat in girls. Obesity presents numerous problems for the child. In addition to negatively impacting learning and increasing the risk of obesity in adulthood, childhood obesity is the leading cause of paediatric hypertension, is associated with Type II diabetes mellitus, increases the risk of coronary heart disease, increases stress on the weight-bearing joints, lowers self-esteem, and affects grades and relationships with peers. Some authorities feel that social and psychological problems are the most significant consequences of obesity in children.

Abdominal muscular strength refers to the ability to exert force against a resistance or resist a force for a short period of time. Abdominal muscular endurance refers to the ability to keep working muscles over a period of time without becoming tired or fatigued. Usually, doing something once or using a short ‘burst’ of energy or exertion involves muscular strength while repetitive movements and long-term exertion involve muscular endurance. Most activities require some use of muscular strength but may demand more muscular endurance to keep going or be needed to complete a task.

Every physical education class begins with a warm-up phase that is beneficial in the development of flexibility. Flexibility can be defined as a person’s ability to move a muscle or joint through a full range of motion. The amount of flexibility that a person possesses can be seen by how easily they can bend, twist or stretch. A person’s flexibility can vary from joint to joint; they may have excellent range of motion in the shoulder joint while having limited range of motion in the hip joint. People who are active tend to have better flexibility than someone who is sedentary. Being sedentary can cause people to have weak and / or stiff joints. People develop flexibility during the warm-up phase of an exercise programme and will better maintain their flexibility by re-stretching during the cool down phase after an activity. Power walking, jogging, performing jumping jacks or other low-intensity activities can be used to ‘warm the muscle’ and increase the amount of oxygen and nutrients going to the muscles before stretching. This will make stretching easier and less dangerous.

Regular participation in moderate and vigorous levels of exercise increases physical fitness, which can lead to many health benefits. Health
related physical fitness education is an important component of a physical
education. Fit students feel better, look better, have more energy and are better
learners. A well-designed fitness assessment process provides students,
teachers, and parents with the necessary information to design an
individualized programme of fitness for each student.

The present study was designed to assess the health related physical
fitness status of school boys and would provide norms of health related
physical fitness for school boys of Kandi and Non-Kandi areas of Punjab state.
Health related physical fitness consists of those components of physical fitness
that have a relationship with good health. In present study, the investigator
assessed the various variables such as cardio-reparatory fitness, body
composition, abdominal muscular strength and endurance and flexibility.
However, the degree of development of each varies with the type of physical
activity.

The problem studied for the present research was titled as
“Comparison of Health Related Physical Fitness among Boys of Punjab
State Kandi and Non- Kandi Area”

The objectives set for the present study were:
1. To compare Health Related Physical Fitness components between
Kandi and Non- Kandi area boys.
2. To find out Health Related Physical Fitness differences among
various age groups of Kandi area boys.
3. To find out Health Related Physical Fitness differences among
various age groups of Non- Kandi area boys.
4. To develop Health Related Physical Fitness norms for different age
groups of Kandi area boys.
5. To develop Health Related Physical Fitness norms for different age
groups of Non-Kandi area boys.
6. To develop norms for total sample of Kandi and Non-Kandi area
boys in case of insignificant differences between these groups on
Health Related Physical Fitness.
The hypotheses formulated for the present study were:

1. There would be no significant differences on the variable Health Related Physical Fitness of Kandi and Non-Kandi area boys.

2. There would be no significant differences on the variable Health Related Physical Fitness of different age groups of Kandi area boys.

3. There would be no significant differences on the variable Health Related Physical Fitness of different age groups of Non-Kandi area boys.

The delimitations of the present study were:

1. The study was delimited to the boys of Kandi and Non-Kandi areas of Punjab state. Kandi area consists of five districts of Punjab namely Sahibzada Ajit Singh Nagar, Roopnagar, Shaheed Bhagat Singh Nagar, Hoshiarpur and Gurdaspur and Non-Kandi area consists of rest of the districts of Punjab state.

2. The study was delimited to the age groups of 13-16 yrs and it was further delimitated to class 8th, 9th and 10th.

The present study had the following limitations:

1. The test itself has some limitations which served as limitation of the study.

2. Other variables such as interest, attitude, co-operation, home environment, daily-routine, motivation and diet could not be controlled and served as another limitation of the study.

The Statistical techniques employed for the present study were:

The Analysis of Variance (ANOVA) was applied to find out the significant differences among various age groups/classes of Kandi and Non-Kandi area boys. Scheffe’s post-hoc of test was applied to see the direction and significance of differences where ‘F’ ratio was found significant. T-test was applied to compare Kandi and Non-Kandi area boys to test the hypotheses. For the development of norms, 6 Sigma scale and Percentile were
applied to prepare the norms for different age groups. The level of significance was set at 0.05.

FINDINGS OF THE STUDY

FINDINGS REGARDING KANDI AND NON-KANDI AREA BOYS (13-14 YEARS CLASS 8th) ON THE VARIABLES; CARDIO-RESPIRATORY FUNCTION, BODY COMPOSITION, ABDOMINAL MUSCULAR STRENGTH & ENDURANCE AND FLEXIBILITY

- It is evident from Table-4.1 that significant differences were found between Kandi and Non-Kandi area boys on the variables i.e. cardio-respiratory function and body composition whereas no significant differences were observed between both the groups on the variables i.e. abdominal muscular strength & endurance and flexibility.

FINDINGS REGARDING KANDI AND NON-KANDI AREA BOYS (14-15 YEARS CLASS 9th) ON THE VARIABLES; CARDIO-RESPIRATORY FUNCTION, BODY COMPOSITION, ABDOMINAL MUSCULAR STRENGTH & ENDURANCE AND FLEXIBILITY

- It has been seen from Table-4.2 that significant differences exist between Kandi and Non-Kandi area boys on the variables; cardio-respiratory function, body composition, abdominal muscular strength & endurance and flexibility.

FINDINGS REGARDING KANDI AND NON-KANDI AREA BOYS (15-16 YEARS CLASS 10th) ON THE VARIABLES; CARDIO-RESPIRATORY FUNCTION, BODY COMPOSITION, ABDOMINAL MUSCULAR STRENGTH & ENDURANCE AND FLEXIBILITY

- It has been observed from Table-4.3 that significant differences were found between Kandi and Non-Kandi area boys on the variables i.e. cardio-respiratory function, body composition and flexibility whereas insignificant differences were observed between both the groups on the variables i.e. abdominal muscular strength & endurance.
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FINDINGS REGARDING KANDI AND NON-KANDI AREA BOYS (13-16 YEARS CLASS 8th, 9th & 10th) ON THE VARIABLES; CARDIO-RESPIRATORY FUNCTION, BODY COMPOSITION, ABDOMINAL MUSCULAR STRENGTH & ENDURANCE AND FLEXIBILITY

- Table-4.4 revealed significant differences between Kandi and Non-Kandi area boys (13-16 years class 8th, 9th & 10th total sample) on the variables i.e. cardio-respiratory function, body composition and flexibility whereas no significant differences were found between the groups in question on the variables i.e. abdominal muscular strength & endurance.

FINDINGS REGARDING ANALYSIS OF VARIANCE (ANOVA) RESULTS WITH REGARD TO KANDI AREA BOYS (13-16 YEARS CLASS 8th, 9th & 10th) ON THE VARIABLES CARDIO-RESPIRATORY FUNCTION

- It is evident from table-4.5 and 4.6 that significant differences were found among three different age groups with regard to health related physical fitness of kandi area boys on the variable cardio-respiratory function.
- Significant difference exists between 13-14 years (class 8th) and 14-15 years (class 9th). It is found that 14-15 years (class 9th) group has performed significantly better on the variable maximal functional capacity and endurance of the cardio-respiratory system.
- Significant difference was found between 13-14 years (class 8th) and 15-16 years (Class 10th). It is found that group 15-16 years (class 10th) has performed significantly better on the variable maximal functional capacity and endurance of the cardio-respiratory system.
- Significant difference has been found between 14-15 years (class 9th) and 15-16 years (Class 10th). It has been observed that group 15-16 years (class 10th) has performed significantly better on the variable maximal functional capacity and endurance of the cardio-respiratory system.
FINDINGS REGARDING ANALYSIS OF VARIANCE (ANOVA) RESULTS WITH REGARD TO KANDI AREA BOYS (13-16 YEARS CLASS 8th, 9th & 10th) ON THE VARIABLE BODY COMPOSITION

- It has been seen from table-4.7 and 4.8 that no significant differences were found among various age groups of kandi area boys on the variable body composition.
- While comparing the mean scores of 13-14 years (class 8th) and 14-15 years (class 9th), it is found that group 13-14 years (class 8th) has better body composition as they had lesser mean scores which show that they had lesser fat level.
- When comparing the mean scores of 13-14 years (class 8th) and 15-16 years (Class 10th), it is found that group 13-14 years (class 8th) had lesser fat level.
- While comparing the mean scores of 14-15 years (class 9th) and 15-16 years (Class 10th), it has been observed that group 14-15 years (class 9th) had lesser mean scores which show that they had lesser fat level.

FINDINGS REGARDING ANALYSIS OF VARIANCE (ANOVA) RESULTS WITH REGARD TO KANDI AREA BOYS (13-16 YEARS CLASS 8th, 9th & 10th) ON THE VARIABLE ABDOMINAL MUSCULAR STRENGTH & ENDURANCE

- Table-4.9 and 4.10 revealed significant differences among various age groups of kandi area boys on the variable abdominal muscular strength & endurance.
- Significant difference exists between 13-14 years (class 8th) and 14-15 years (class 9th). It is found that 14-15 years (class 9th) group has performed significantly better on the variable abdominal muscular strength & endurance.
- Significant difference was found between 13-14 years (class 8th) and 15-16 years (Class 10th). It is found that group 15-16 years (class 10th) has performed significantly better on the variable abdominal muscular strength & endurance.
Significant difference has been found between 14-15 years (class 9th) and 15-16 years (Class 10th). It has been observed that group 15-16 years (class 10th) has performed significantly better on the variable abdominal muscular strength & endurance.

FINDINGS REGARDING ANALYSIS OF VARIANCE (ANOVA)
RESULTS WITH REGARD TO KANDI AREA BOYS (13-16 YEARS CLASS 8th, 9th & 10th) ON THE VARIABLE FLEXIBILITY

- In table-4.11 and 4.12, significant differences have been found among various age groups of kandi area boys on the variable flexibility.
- Significant difference exists between 13-14 years (class 8th) and 14-15 years (class 9th). It is found that 14-15 years (class 9th) group has performed significantly better on the variable flexibility (extensibility) of the low back and posterior thighs.
- Significant difference was found between 13-14 years (class 8th) and 15-16 years (Class 10th). It is found that group 15-16 years (class 10th) has performed significantly better on the variable flexibility (extensibility) of the low back and posterior thighs.
- Significant difference has been found between 14-15 years (class 9th) and 15-16 years (Class 10th). It has been observed that group 15-16 years (class 10th) has performed significantly better on the variable flexibility (extensibility) of the low back and posterior thighs.

FINDINGS REGARDING ANALYSIS OF VARIANCE (ANOVA)
RESULTS WITH REGARD TO NON-KANDI AREA BOYS (13-16 YEARS CLASS 8th, 9th & 10th) ON THE VARIABLE CARDIO-RESPIRATORY FUNCTION

- It is evident from table-4.13 and 4.14 that significant differences were found among various age groups with regard to health related physical fitness of Non-kandi area boys on the variable cardio-respiratory function.
- Significant difference found between 13-14 years (class 8th) and 14-15 years (class 9th). It is found that 14-15 years (class 9th) group has performed significantly better on the variable maximal functional capacity and endurance of the cardio-respiratory system.
Significant difference was found between 13-14 years (class 8th) and 15-16 years (Class 10th). It is found that group 15-16 years (class 10th) has performed significantly better on the variable maximal functional capacity and endurance of the cardio-respiratory system.

No significant difference was found between 14-15 years (class 9th) and 15-16 years (Class 10th). But while comparing the mean scores of both the groups, it has been observed that group 15-16 years (class 10th) has performed better on the variable maximal functional capacity and endurance of the cardio-respiratory system.

**FINDINGS REGARDING ANALYSIS OF VARIANCE (ANOVA)**

**RESULTS WITH REGARD TO NON-KANDI AREA BOYS (13-16 YEARS CLASS 8th, 9th & 10th) ON THE VARIABLE BODY COMPOSITION**

- It has been observed from table-4.15 and 4.16 that no significant differences were found among various age groups of Non-kandi area boys on the variable body composition.

- But when compared the mean scores of 13-14 years (class 8th) and 14-15 years (class 9th), it is found that group 13-14 years (class 8th) has better body composition as they had lesser mean scores which show that they had lesser fat level.

- When comparing the mean scores of 13-14 years (class 8th) and 15-16 years (Class 10th), it is found that group 13-14 years (class 8th) had lesser fat level.

- While comparing the mean scores of 14-15 years (class 9th) and 15-16 years (Class 10th), it has been observed that group 15-16 years (class 10th) had lesser mean scores which show that they had lesser fat level.
FINDINGS REGARDING ANALYSIS OF VARIANCE (ANOVA) 
RESULTS WITH REGARD TO NON-KANDI AREA BOYS (13-16 
YEARS CLASS 8th, 9th & 10th) ON THE VARIABLE ABDOMINAL 
MUSCULAR STRENGTH & ENDURANCE

- Table-4.17 and 4.18 revealed significant differences among various age 
groups of Non-kandi area boys on the variable abdominal muscular 
strength & endurance.

- Significant difference found between 13-14 years (class 8th) and 14-15 
years (class 9th). It is found that 14-15 years (class 9th) group has 
performed significantly better on the variable abdominal muscular strength 
& endurance.

- Significant difference was found between 13-14 years (class 8th) and 15-16 
years (Class 10th). It is found that group 15-16 years (class 10th) has 
performed significantly better on the variable abdominal muscular strength 
& endurance.

- Significant difference has been found between 14-15 years (class 9th) and 
15-16 years (Class 10th). It has been observed that group 15-16 years (class 
10th) has performed significantly better on the variable abdominal 
muscular strength & endurance.

FINDINGS REGARDING ANALYSIS OF VARIANCE (ANOVA) 
RESULTS WITH REGARD TO NON-KANDI AREA BOYS 
(13-16 YEARS CLASS 8th, 9th & 10th) ON THE VARIABLE 
FLEXIBILITY

- It is evident from table-4.19 and 4.20 that significant differences have been 
found among various age groups of Non-kandi area boys on the variable 
flexibility.

- Significant difference has been found between 13-14 years (class 8th) and 
14-15 years (class 9th). It is found that 14-15 years (class 9th) group has 
performed significantly better on the variable flexibility (extensibility) of 
the low back and posterior thighs.

- Significant difference was found between 13-14 years (class 8th) and 15-16 
years (Class 10th). It is found that group 15-16 years (class 10th) has
performed significantly better on the variable flexibility (extensibility) of the low back and posterior thighs.

- Significant difference has been found between 14-15 years (class 9\textsuperscript{th}) and 15-16 years (Class 10\textsuperscript{th}). It has been observed that group 15-16 years (class 10\textsuperscript{th}) has performed significantly better on the variable flexibility (extensibility) of the low back and posterior thighs.

CONCLUSIONS OF THE STUDY

On the basis of above findings, the following conclusions have been drawn:

1. It is concluded from the above findings that Kandi area boys 13-14 years (class 8\textsuperscript{th}) demonstrated significantly better maximal functional capacity and endurance and body composition than Non-Kandi area boys 13-14 years (class 8\textsuperscript{th}).

2. Non-Kandi area boys 13-14 years (class 8\textsuperscript{th}) exhibited better abdominal muscular strength & endurance than Kandi area boys 13-14 years (class 8\textsuperscript{th}) though not significantly.

3. Kandi area boys 13-14 years (class 8\textsuperscript{th}) demonstrated better flexibility (extensibility) of the low back and posterior thighs than Non-Kandi area boys 13-14 years (class 8\textsuperscript{th}) but not significantly.

4. Kandi area boys 14-15 years (class 9\textsuperscript{th}) demonstrated significantly better maximal functional capacity and endurance, body composition, abdominal muscular strength & endurance and flexibility (extensibility) of the low back and posterior thighs than Non-Kandi area boys 14-15 years (class 9\textsuperscript{th}).

5. Kandi area boys 15-16 years (class 10\textsuperscript{th}) exhibited significantly better maximal functional capacity and endurance, body composition and flexibility (extensibility) of the low back and posterior thighs than Non-Kandi area boys 15-16 years (class 10\textsuperscript{th}). Similarly the Kandi area boys 15-16 years (class 10\textsuperscript{th}) demonstrated better abdominal muscular strength & endurance than Non-Kandi area boys 15-16 years (class 10\textsuperscript{th}) but not significantly.
6. The total Kandi area boys 13-16 years (class 8th, 9th & 10th) exhibited significantly better maximal functional capacity and endurance, body composition and flexibility (extensibility) of the low back and posterior thighs than Non-Kandi area boys 13-16 years (class 8th, 9th & 10th). Similarly the Kandi area boys 13-16 years (class 8th, 9th & 10th) demonstrated better on abdominal muscular strength & endurance than Non-Kandi area boys 13-16 years (class 8th, 9th & 10th) but not significantly.

7. It is concluded from the results of Analysis of Variance (ANOVA) of various age groups of Kandi area that class 9th demonstrated significantly better maximal functional capacity and endurance than class 8th. Class 10th exhibited significantly better on maximal functional capacity and endurance than class 8th and class 9th.

8. Class 8th demonstrated better body composition than class 9th and class 10th. Similarly class 9th demonstrated better on the said variable than class 10th though not significantly.

9. Class 9th exhibited significantly better abdominal muscular strength & endurance than class 8th. Similarly class 10th demonstrated significantly better than class 8th and class 9th on the said variable.

10. Class 9th showed significantly better flexibility (extensibility) of the low back and posterior thighs than class 8th. Similarly class 10th demonstrated significantly better than class 8th and class 9th on the said variable.

11. The results of Analysis of Variance (ANOVA) of various age groups of Non-Kandi area revealed that class 9th demonstrated significantly better maximal functional capacity and endurance than class 8th. Similarly class 10th demonstrated significantly better than class 8th on the said variable. But class 10th exhibited better than class 9th though not significantly on the said variable.

12. Class 8th demonstrated better body composition than class 9th and class 10th. Similarly class 10th exhibited better than class 9th on the said variable but not significantly.
13. Class 9th demonstrated significantly better abdominal muscular strength & endurance than class 8th. Similarly class 10th exhibited significantly better than class 8th and class 9th on the said variable.

14. Class 9th exhibited significantly better flexibility (extensibility) of the low back and posterior thighs than class 8th. Similarly class 10th demonstrated significantly better than class 8th and class 9th on the said variable.

RECOMMENDATIONS FOR FUTURE RESEARCH

1. Similar study can be conducted to compare the health related physical fitness of Kandi and Non-Kandi area school girls in the same age group of Punjab state.

2. Similar study can be conducted to compare the health related physical fitness of other age groups of Kandi and Non-Kandi area school boys and girls of Punjab state.

3. Norms can be developed for health related physical fitness of Kandi and Non-Kandi area school girls for various age groups of Punjab state.

4. Similar study can be conducted to compare the health related physical fitness of the boys and girls of other states of India.

5. Keeping in mind the present health related physical fitness status of school boys and girls, a suitable fitness training schedule can be designed to improve the health related physical fitness.

6. The findings of present study would also be useful for the physical education teachers in classifying the boys for different sports activities on the basis of their health related physical fitness status.

7. The findings of present study could play an important role in highlighting the weaknesses of the boys on the different health related physical fitness components where they are required to work more to keep themselves healthy.