CHAPTER 1

Introduction
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Physical exercise is an activity in which every human being engages, to one degree or another, to know the physiological mechanism that sustains and acts as the basis of every body response to exercise. In the course of physical exertion, a number of coordinated and compensatory adjustments take place throughout the body, which involve metabolic functions and the nervous, muscular, circulatory and respiratory systems. Important roles are played by environmental conditions, stresses, training and fatigue.¹

In the available literature of science of coaching and exercise physiology, much information regarding intensive and extensive interval running methods is not available. Therefore it will be essential for coaches and sportsmen to have a clear cut idea regarding the effects of intensive and extensive interval training methods so that desired changes in aerobic and anaerobic capacities could be brought about. So it was thought worthwhile by the research scholar to investigate the effects of extensive and intensive internal training on muscular performance cardiovascular efficiency and body composition.

Studying of muscular performance, cardiovascular efficiency and Body composition as physical and health components among school children assumes much importance because children are the future nation builders. Interval Training improves physical and health components. So the investigator wishes to find out the effects of Intensive and Extensive Internal Training on muscular performance cardiovascular Efficiency and Body composition in varied periods.

Cardiovascular efficiency, being the main parameter of the physical fitness component, plays a vital role in determining one's state of health. Owing to lack of cardiovascular efficiency many people have been unable to meet emergency situations and sudden shocking news and the results have been serious injury to health or imminent death. In modern days even young people are suffering from cardiovascular diseases due to over weight, faulty diets, emotional stress, cigarette smoking and lack of exercise.

Proper conditioning must begin in childhood to prevent cardiovascular disease in later life. One who engages oneself in physical activities from one's childhood the
possibility of suffering from heart disease is almost nil.²

Scientific evidence indicates that the individual who does hard work or who does exercises constantly has a more efficient organism, is less susceptible to illness and will probably live longer. Medical reports demonstrates that lack of exercises contributes to the development of degenerative heart diseases. In essence the greatest effect of an exercise programme is the improved physiological efficiency which supports activity. This improved physiological efficiency is reflected in increased endurance and agility.³

Fitness for effective living has many interrelated components involving intellectual, emotional as well as physical factors. Fitness for effective living implies good health, freedom from disease, abundant strength, agility, endurance and skill to meet the demands of daily living, sufficient reserves to withstand ordinary stresses without causing harmful strain besides mental development and adjustment appropriate to the maturity of the individual.

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In order to have optimum performance in games and sports, the different components of physical and motor fitness, such as speed, strength, endurance, flexibility and agility are the pre-requisites. Unless optimum development takes place in these components, a player will not be able to perform at his/her best during training & competitions. Therefore training programmes should be so organised that they are geared towards harmonious development of all the physical fitness components required for the activity.\(^4\)

The world of games and sports is ever expanding and continuous by progressing. It is dynamic in nature and progressive in outlook. It is not confined to "what has been," its target is to march ahead. Through different types of researches and scientific advancement in general and their application in the field of sports in particular—games and sports have undergone revolutionary changes and crossed many mile stones. Modern technological know-how and highly sophisticated means of training devised by accomplished technical experts have contributed to the expansion of the horizon of achievement. Sportsman and coaches, not being satisfied to rest on their laurels, are making their utmost endeavours to put their best foot

\(^4\) A.K. Uppal, et.al., "Effect of Four week Intensive training in Badminton on selected physical fitness Components of women players. SHPPS Journal 5:2 (April 1982), 51.
forward to attain higher and higher standards through training and exercise.

Much progress has been made in recent years in the acquisition of knowledge about training means and techniques of track events. In modern athletic training specialized exercises are presented for the fullest and optimum development of a particular component of fitness and muscles involved in performing a particular event. Coaches and physical education teachers must extract maximum achievement from their trainees without much strain. This is possible only when coaches and physical education teachers select most beneficial means of training for the athlete.5

Since the individual is a totality, non-divisible into discrete parts, physical fitness affects all phases of human existence. It is vital for the whole person in order to permit total effectiveness. Also involved is the maintenance of sound neuromuscular, cardiovascular and other organic systems by improvement of physical fitness through exercise.6


The capacity of physical work has already been of primary importance in the development of man. At present, more and more physical work is being replaced by machines and automation. Man's physical work capacity treats man a source of mechanical energy. In any type of work an employer would like to find workers with high level of strength, quickness of movement of endurance.\(^7\)

The human body is remarkably adaptable. Within limits it has the ability to adapt itself gradually, yet rather rapidly, and accommodates stresses imposed on it. This progressive adaptation to the stress of muscular work results in an increased ability to perform subsequent muscular activity. The body responds rather specifically to demands placed upon it and this concept is advanced as a unifying principle that applies to any of the characteristics that comprises physical fitness.\(^8\)

The body should be put under stresses of varying intensity and durations. While attempting to overcome these stresses the body adopts rather specifically to these


imposed demands and as a result of this elevates to
tolerance for further activity of greater intensity. The
stresses to be put on the body are in the form of exercises
and if exercises is sufficiently intense, it increases the
capacity to perform more exercises which underline the
development of physical fitness elements such as strength,
endurance and flexibility.⁹

Development of such qualities as neuromuscular skills,
strength, endurance, speed etc., which may collectively be
considered as a representation of the physical or motor
aspect of the individual is probably the most significant
contribution of physical education. The relevance and
importance of participation in artificially structural
activity programmes stem from the fact that man, who is the
result of thousands of years of evolution and has a deep
rooted urge for activity, needs to participate in such
activities for a healthy and meaningful existence.¹⁰

In spite of the fact that endurance is the very
important ability for good performance in sports, in India
it is usually neglected in training in the case of

⁹ Ibid., p.7.

¹⁰ Jesse V. Williams, Developing Democratic Human Relations through Health, Physical Education and Recreation: (Washington: D.C. AAPPE, 1951), p.82.
sprinters, throwers, jumpers, hockey and football etc. Endurance has been wrongly understood to be important only in those sports in which the competition activity lasts without break for many minutes, for example, in long distance running and swimming. In reality all the sportsmen, irrespective of their sport, need a fairly good level of endurance. It enables them to maintain optimum pace and tempo during competition. Technical skills and tactical efficiency in long duration events are greatly effected by their endurance to enable them to be alert and active during competition, thus avoiding possible injuries and serving as bases for tactical behaviour.11

It is almost universally accepted that Interval training is being considered as one of the best methods, to improve the endurance of the athletes. In a game like soccer a player has to continue the activity with fairly good tempo for nearly one to one and half hour. In order to perform various skills a high level of endurance is required. Keeping this idea in view the researcher has made an attempt to find out whether, the interval training could be used as one of the effective methods to improve the

cardiovascular efficiency of the school girls.\textsuperscript{12}

In the last decade a style called interval training has been well received as an outstanding method of developing endurance of athletes. It is a discontinuous method of training. A typical work interval consists of several work periods that are relatively short and very strenuous. They are inter spaced by rest periods, during which the subject makes an active rest approach i.e the subject walks or jogs while partially recovering for the next bout, the length of the recovery period may be based on a previously set-work relief ratio.\textsuperscript{13}

The high intensity of exertion demanded by modern competitive games call for high levels of endurance to play to the end with undiminishning levels of skills as at the commencement of the games, when the duration of the game is either increased by regulations as in football or due to need for extending the game when the competitors are highly matched or when duration is to be extended to break the tie, as in tennis, Badminton, Basketball, Volleyball, Hockey, Hockey,

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Football etc. Thus, development of endurance has become one of the training methods for players in any sport.\textsuperscript{14}

The goal of today's tremendous competition in sports is to exhibit one's excellence and to win. There are numerous factors which are responsible for winning a competition. The performance of the sportsman in individual or in team game is dependent on the suppleness, skill, training, motivation, anxiety, age, sex, physical growth and some physiological and biochemical factors. Like those factors, physique and body composition also play a significant role in an excellent sports performance.\textsuperscript{15}

Physical Education objectives tend to include composition and posture. By measuring body dimensions, physical educators may estimate the effectiveness of a scientific programme. Body Composition involving percent of body fat, may be estimated through the use of skin fold calipers to determine the degree of obesity of the person.


Through the use of a rating scale, persons may be identified who may need remedial work.  

Body Composition is concerned in part with the obesity of the individual. Measuring this aspect of body composition, the total body weight is divided into two components namely, lean body weight and fat body weight. Lean body weight includes, muscle, bone and vital organs. The underlying assumption is that total body weight equals lean body weight plus fat body weight. The higher the percentage of fat body weight, the higher the degree of obesity.

Skin fold measures are considered to be a superior indicator of obesity than is overweight as determined from weight tables. Skin fold thickness gives an estimation of total body fat in as much as fifty percent of the total fat lies immediately under the skin.


17 Ibid. p.221.

Body fat generally has been considered to be a liability in the performance of motor activities. However very few objective studies have been done showing the direct relationship between body fat and the performance of various motor activities. Direct evidence of this nature would be very useful in demonstrating the fact to both athletes and Non-athletes that excess of body fat affects deliriously on Motor performance.

The effectiveness of many physical performance is related to various basic traits found in boys and girls, including their maturation, body size and physique type. Some of these traits are related to heredity; others, such as body weight have hereditary implications but may also be affected by environmental influences including the nature and amount of exercise, nutritional practices, and health habits.19

It is well known that training or conditioning in general produces specific effects on body composition. Usually, after training or conditioning the lean body mass increases, weight of body fat decreases, and depending upon these two factors, the total body weight may alter accordingly. Normally, a subject can be considered obese if

19 Ibid., p.10.
their fat percentage is above 18-20 in case of males and above 30 in case of females.

In both athletic and health related fitness most of the components such as strength, power, endurance, speed, agility and co-ordination are the products of the working of our body machine with different modes and intensities of work. Energy is synthesized biochemically in the muscle only. Here adipose tissue has nothing to do with energy production except that it is the site of store of fat. But, if the amount of fat is high, it is always a burden to the subject in relation to physical fitness as the weight of the fat is always an extra load which he is to carry during work and moreover extra fat in the form of adipose tissue interferes with efficiency of the thermo regulation which is important during any work to keep the body temperature at a constant level. Hence, ideal body composition is always significantly related to physical fitness of an individual.20

With the increasing involvement of women in athletics and the new federal guidelines requiring institutions to provide equal opportunity for women to participate in intramural, physical education and athletic activities, more

definite research concerning the physical capacities of female participants is needed. Although a considerable amount of information is available concerning the relationship of body structure and body composition to physical performance in boys, little research has been conducted on girls. 21

The components of physique and body composition such as size, body fat and lean body mass have been shown to affect physical performance capacity. Body fat is particularly important in women. Researches have shown a relationship between the amount of body fat and physical performance in the field. Distribution of subcutaneous tissue in different parts of the body depend upon two factors, first the amount of this component present, and second the nature and order of priority of the functions which the organism has to carry out. Thus fat can be reduced as a result of strenuous physical activity. 22


STATEMENT OF THE PROBLEM

The purpose of this study was to analyse the effects of the Intensive and Extensive Interval Training on Muscular Performance, Cardiovascular efficiency and body composition of school girls.

The second purpose of the study was to find out the effects of the Intensive and Extensive Interval training on Muscular Performance cardiovascular efficiency and body composition in varied periods.

HYPOTHESES

1. It was hypothesised that the Intensive and Extensive Interval Training may not have any statistically significant developmental effects on Muscular performance, Cardio-vascular Efficiency and Percentage of Body fat.

2. It was hypothesised that the Intensive and Extensive Interval Training may not have any statistically significant developmental effects on Muscular Performance, Cardiovascular Efficiency and Percentage of Body Fat at Varied Periods.
3. It was hypothesized further that the Intensive Interval Training Group may not be better than Extensive Interval Training Group in developing the Muscular Performance, Cardiovascular Efficiency and Percentage of Body Fat.

SIGNIFICANCE OF THE PROBLEM

The present study may be considered significant because of the following benefits.

1. This study provides an opportunity to find out the effect of Intensive Interval Training and Extensive Interval Training for the promotion of effective sports Training programme.

2. These findings may be of great help to suggest ways and means in formulating Extensive and Intensive Interval training for the school children to improve their muscular performance. The test results permits us to draw satisfactory conclusions regarding the cardiovascular efficiency of the body.

3. Muscular performance and cardiovascular efficiency would kindle the fitness consciousness among the students.
4. It will help the coaches and physical education teachers to find out in which period they are attaining their maximum performance and also help them to find out their progress in every week.

DELIMITATIONS

1. The study was delimited to the female students aged between 12 and 16 years of Chidambaram Chettiar Girls Higher Secondary School, Kottaiyur.

2. Each group consisted of thirty subjects which was assumed to be large enough for the purpose of this study.

3. The Extensive interval training method is limited to 60 to 80 percent Intensity. But the Intensive interval training is limited to 80 to 90 percent Intensity.

4. The study was restricted to the following variables ie. Muscular performance, cardiovascular efficiency and Body composition.

5. Only the Percentage of Body Fat was taken into account for determining Body Composition.

6. The data were collected only on Second, Fourth, Sixth, Eighth and Tenth weeks only.
LIMITATIONS

This research study was limited in the following respects and limitations should be taken into consideration while interpreting the results.

1. Certain factors like habits, life style, daily routine, diet and others which may have an effect on the results of the study was not taken into consideration.

2. No-attempt has been made to control the factors like air resistance, intensity of light, atmosphere and temperature.

3. No special motivational technique was used during testing. Therefore the difference that occurred in performance due to lack of motivation was recognized as a limitation for the study.

4. The students belonging to different economic and educational backgrounds whose status affected their performance was not taken into consideration.
5. The skills of the subjects and their background experience in endurance activities were not taken into consideration.

6. Physical maturity which might have taken place during this period was not taken into consideration.

MEANING AND DEFINITION OF THE TERMS

Interval Training

Interval training is based on the interval principle, activity done with pauses of incomplete recovery. The activity is done for sometime after which there is a recovery pause which is insufficient for complete recovery. The guiding principle of interval method is that the heart rate should go up to 180 beats/minutes during the workout after which recovery should be given. When the heart rate comes down to 120 - 130 beats/minute, the next repetition is to be started. There are several variations of the interval method, each having its own specific effects. The methods based on the Interval principle can be classified either according to the duration or according to the intensity of the activity.²³

Intensive and Extensive Interval Method

Scholish classifies the Interval Method according to the intensity of the activity into Intensive Interval Method (80-90% intensity) and Extensive Interval method (60-80% Intensity). 24

Muscular Strength

Muscular Strength is defined as "the maximum force or tension level that can be produced by the Muscle group." 25

Arm and Shoulder Girdle Strength

The Muscular Strength and endurance of the arms and shoulder girdle involve the ability to move or support one's body weight with the arms. 26

24 Scholish as cited by, Ibid., p.105.


26 Ibid., p.299.
Agility

Agility is the Ability of the body or parts of the body to change directions rapidly and accurately. 27

Power

It is the capacity of the individual to bring into play maximum muscle contraction at the fastest rate of speed. 28

Speed

Speed is defined as the capacity of the individual to perform successive movements of the same pattern at a fast rate. 29

Cardio Vascular Endurance

Endurance is the result of a physiologic capacity of the individual to sustain movement over a period of time. A strong muscle can be improved in endurance by developing more efficiency so that its recovery rate will be faster. This phenomenon of recovery is related to the number of functioning capillaries that are present within the muscle.

28 Ibid.
29 Ibid.
as well as the strength of the muscle itself.

Muscular Performance

Muscular performance can be defined as the ability to perform motor skills which require Muscular Power, Muscular Strength, Muscular Endurance, Speed, Agility and Cardiovascular Endurance in an efficient Manner.

Cardiovascular Efficiency

Cardiovascular Efficiency means "the ability of the circulatory and respiratory systems to adjust to vigorous exercise and to recover from the effect of that exercise.

Body Composition

The major structural components of the body are the muscle, bone and fat.30

The body composition may be defined as the relative percentage of fat and fat free body mass.31
