Chapter I

INTRODUCTION

The concept of sports starts from the physical education that forms the basis of competitive sports. The programmes of physical education on the other hand, have been given a new look. The physical education, in fact, seems to have taken new turn in the form of sports sciences. The sports sciences, in turn, have taken their birth from various basic sciences. For many years, the research in sports was being undertaken within these basic sciences. But with the advancement of time the new specialisations and micro-specialisations have taken a respectable position. As a matter of fact, research in sports now a days embraces knowledge from various disciplines of human sciences. The human biologist is interested to study the morphology and motor learning in sports, the physiologist, the functioning of various parts of the body of a sportsman, the kinesiologist, the movement and skill, the medical doctors, the traumatology and rehabilitation, the nutritionist, the food intake; the psychologist, the personality traits, and the sociologist, the social and cultural background of the sportsmen.¹

Human beings are by nature competitive and ambitions for their excellence in all athletic performances. Every man or

nation wants to show their supremacy by challenging other nations. Thus, this challenge stimulates, inspires and motivates all the nations to sweat and strive to run faster, jump higher, throw farther and exhibit greater strength, endurance and skills in present competitive sports world. This can only be possible through scientific, systematic and planned sports training as well as channelising them into appropriate games and sports by finding out their potentialities.

The sun is the ultimate source of all energy on earth, for it is through solar radiation and carbohydrates in plants are formed. Humans and animals eat plants and other animals for food. In the human body, food energy is used to manufacture adenosine triphosphate, or ATP - the chemical compound that, when broken down, supplies energy for muscular contraction and other biological processes.²

The production of ATP involves both anaerobic (without oxygen) and aerobic (with oxygen) metabolism (chemical reactions). There are two anaerobic systems: The phosphagen, on ATP - PC system; and Anaerobic Glycolysis, on the lactic acid system.³

³Ibid.
The phosphagens (ATP + PC, a chemical compound similar to ATP) are stored within the contractile mechanisms of muscle and provide the most rapidly available source of ATP for use by the muscle. This energy system is the major one used for ATP production during high - intensity, short duration exercises such as sprinting 100 meters. Anaerobic glycolysis releases energy for ATP synthesis through the partial break-down of carbohydrates (glycogen and glucose) to lactic acid. Lactic acid causes muscular fatigue when it accumulates in the blood and muscles. Anaerobic glycolysis is also a major supplier of ATP during high-intensity, short duration activities, such as sprinting 400 and 800 meters. Activities that depend heavily on the phosphogen system and anaerobic glycolysis are called anerobic activities.\(^4\)

The aerobic, or oxygen, system releases energy for ATP production from the break down mainly of carbohydrates and fats, and sometimes of protein, to carbon dioxide and water. Although the oxygen system yields by far the most ATP, it requires several series of complex chemical reactions. With carbo-hydrates, in the first series of reactions, called aerobic glycolysis, glycogen is broken down to pyruvic acid, then in the krebs cycle, carbon dioxide is produced and electrons, in the form of hydrogen atoms, are removed. In the final series of reactions, hydrogen atoms (electrons) are "transported" to the oxygen we breath; water is

\(^4\)Ibid.
formed, and ATP is synthesized. With fats as the fuel, the reactions are the same with the exception of the first series, which in this case is called beta oxidation. The oxygen system is used predominantly during low-intensity, long duration exercises, such as marathon. Such activities are called aerobic exercises.\(^5\)

Performances of long duration such as channel swimming, cycling, marathon running, recreational jogging, long distance walking, or a laborer who works at a machine in a factory for eight hours require a relatively constant supply of energy. While the anaerobic break down of glycogen, ATP and creatine phosphate contribute at the beginning of the exercise, the energy provided for this type of work is provided nearly exclusively from the aerobic break down of fat, glycogen and glucose with little or no lactic acid production. As the work is prolonged, and the glucose supply is nearly depleted a greater contribution of the energy fuel comes from the stored fat as well as from the fatty acids in the blood. This would seem to indicate that as exercise is prolonged, there is an increase activity of enzymes involved in the break down of fatty acids.\(^6\)

It should be emphasized that in long duration activities of low intensity such as leisure walking, golf, etc. lactic acid

\(^5\)Ibid.

levels do not go much above the resting levels. This is due to the fact that the stored ATP and creatine phosphate is sufficient to meet the demand until a steady state of oxygen consumption or aerobic metabolism is reached.\(^7\)

Generally included in the category of short duration, high intensity exercises are activities which can be kept up for no more than one or two minutes. These include swimming events up to 200 meters or track events up to 800 meters. Also included are jumping, throwing and vaulting in track, cycling, sprints, weight lifting, fast breaks in basketball games, the golf swing, and some gymnastic activities including apparatus routines.\(^8\)

The primary food fuel is the stored ATP and glycogen. If the maximal, all-out exercises are repeated many times with intervening periods (such as football, basketball, and baseball games) then fatty acids from the blood may play a minor role as an energy source. Apparently, ATP and CP are replenished during intervening rest periods at the expense of not only glucose, but perhaps blood glucosed and fatty acids as well. The predominant metabolic pathway is anaerobic with the aerobic cycle playing only a minor part.\(^9\)

\(^{7}\) Ibid.
\(^{8}\) Ibid.
\(^{9}\) Ibid.
Human body as a system which has certain function to perform and which has certain basic materials available to it - fat, viscera, muscle skeletal tissue, the sense and the nervous system. The amount of any material in and physique are largely determined genetically although besides genetic variations some modification can occur. Precisely, how the components or materials of physique are distributed in different parts of the body seems likely to depend upon two factors, first, the amount of each component present. One aspect of the scientific approach which is receiving greater attention is that of body composition. More specifically, the management of the athlete's body composition to achieve optimal playing weight is gaining significance in the overall training programme. By achieving his optimum weight, the athletes can minimize the negative effect of excess body fat on activity without sacrificing the required nutrition for successful performance. The constitutional complex of factors doubtlessly has a big role to play with regard to trainability as well as for the resistance vis-a-vis negative and unphysiological loads. Genotypical characteristics of the apparatus of motion the circulation, metabolism and nervous system, given by hereditary predisposition, marks upto two thirds of the basis for top performance always depending on the kind of sports practices. Because of many of these being endogenous and in principle fixed by pre-given factors preclude certain performances from the start, it is of the greatest importance to make a proper choice of children or teenagers
for better performance training.¹⁰

Body composition is concerned in part with the obesity. In measuring this aspect of body composition the total body weight is divided into two components - lean body weight and fat body weight. Lean body weight includes muscles, bone and vital organs.¹¹ The study of body composition in sports is essential, because it reveals the development of different tissue components in sportsmen specializing in different physical activities. A particular proportion of the lean body mass or fat may be advantageous or disadvantages in some way in the performance of certain events. For example, excessive body fat is useful in the case of channel swimmers (Pugh and Edholm, 1955), but is disadvantageous in the case of long distance runners (Buskrik and Taylor, 1957, Sills, 1960).¹²

Normally, a person starts taking part in a game or event without proper guidance. It is thus a sheer chance that his choice of the sport may be suitable to his inherent capabilities. Therefore, the failure to become a champion in most of the cases is inevitable. Thus, there is an urgent need to provide counselling to

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¹²Sodhi and Sidhu, Physique and Selection of Sportsmen, p.45.
those endowed with such suitable characteristics that form the basis of performance in a game or event. This may be one of the most important factors that can help in raising the standard of sports in most of the countries.\(^\text{13}\)

India is a vast and rich country inhabited by the poor. It has many regional variations in the matter of ethnicity, geographical and social environment. These regional variations have a great impact in the matter of trade and occupations of people and also have an influence on the type of sports activities engaged in by them. As, the people of India are poor, it is very difficult for the common people to go for expensive techniques like 'muscle biopsy' test for the selection of an individual for a particular game or event. Hence, a few inexpensive but scientific tests have been taken by the investigator to know the aerobic and anaerobic performance and body composition of non-sportsmen for the selection of a particular event.

**Statement of the Problem**

The purpose of the study was to compare non-sportswomen belonging to different regions of India on the aerobic and anaerobic performances and body composition.

\(^{13}\)Ibid., p. 6.
Delimitations

1. For the purpose of selecting non-sportswomen belonging to different regions of India mainly (North, South, East and West) the study was delimited to the Kendriya Vvidyalaya, Faridabad, Madras, Barackpore (Calcutta) and Bombay respectively.

2. The study was restricted to the women students studying in classes 9th through 12th.

3. The study was further restricted to the following:
   a) Aerobic Performance
   b) Anaerobic Performance.
   c) Body Composition.

Limitation

Since the Kendriya Vidyalayas admit students of the Govt. employees especially those who have had more number of transfers from one place to another in the last five years are given preference. The research scholar had tried to eliminate those type of subjects in this study. The subjects may not be representing the true regions. Hence, the choice of food, participation in games and sports were not under the control of research scholar. The nullifying effect of these factors and life styles that may vary considerably among the students were recognised as a limitation.

Hypothesis

On the basis of the literature reviewed, research findings and scholar's own understanding of the problem it was hypothesised
that the non sportswomen belonging to different regions of India would exhibit significant differences when compared to aerobic and anaerobic performances and body composition.

Definitions and Explanation of the Terms

Aerobic Work

Physical activities in which metabolic demands can be met by the oxygen transport system i.e. oxygen supplied by respiration during activity provide significant energy for executing the activities.\textsuperscript{14}

Anaerobic Work

The activity which exceeds the ability of oxygen transport system to supply the necessary energy. Energy liberated by breakdown of substances not, involving consumption of oxygen is necessary for the competition of the activity.\textsuperscript{15}

Body Composition

Theoretically, the body can be divided into several compartments according to definable tissues. A two compartment model is commonly used in which the body is divided into fat and fat-free compartments. A four compartment model divides the body into a fat position, and further sub-divides the fat free position


\textsuperscript{15} Ibid.
into skeleton, muscle and the remainder (organs, nerves, blood vessels, and fluids). 16

**Significance of the Study**

It may be observed that in track and field events people from the Southern Region have dominated in sport sprints (100 mts. and 200 mts.) and jumping events whereas people from the Northern Region have excelled in throwing events and middle and long distance runs at the national level. The observed dominance of a particular region may have its basis in many variable factors out of which anaerobic and aerobic performances are of utmost importance, because they underlie the performances of the nature of short sprints as well as in the long distances respectively. Therefore, the present study was planned with a view to resolve the observed dominance of a particular region with regard to the aerobic and anaerobic performances and body composition. The result of this study may also help in the following ways:

1. The study will be significance for the physical education teachers and coaches for selectiving the non-sportswomen for a particular event i.e. sprints and long distances.

2. The result of the study will provide a guideline for training for different events with regard to aerobic and anaerobic

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performances.

3. The findings of the study may help the physical education teachers and coaches to know whether a particular portion of lean body mass on fat may be of advantage or disadvantage in some way or other in the performance of certain events.

4. The study will highlight the influence of cultural, environmental and dietary differences on the aerobic and anaerobic performances and body composition.