Chapter I

INTRODUCTION

Human beings are born in this world for a purpose. We are put here to become a success. We ought to enjoy the sweet taste of success to find peace and happiness to live on interesting and abundant life.

The only way to live successfully and to lead our life without limitation is not a formula which can be sold. We can't buy it with money. It comes to us free without money and without price. There is a price, of course, which requires our own application to certain definite laws. It is not guaranteed to be an easy way but it is guaranteed to be the only way to real success.

Some successful athletes of the world toiled and trained hard to get their picture on page one of the newspaper, or on the first covers of popular magazines. This inflates and briefly titillates their ego, but it never satisfies them for long. Still, there is no limit to their progress, with a gnawing inner hunger to reach the unreached. So they are restless and discontented. Similarly, there is nothing that the public forgets so
quickly as yesterday’s Olympic news.

Certainly nothing in life is more important than to know what is our extreme limit—and how to reach it. One would think that limitation would be the goal that should excite dynamic ambition. Ambition, of course, is more than desire. It is desire plus incentive, determination and will to achieve the desire.

The capacity for physical work has always been of primary importance in the development of man. We are not usually aware of this fact, however, until we are sick and our performance capacity is reduced. Since, in today’s society, performance in many areas is of only relatively minor importance, it seems surprising that scientists from many disciplines have convened in order to discuss such a multifaceted topic as the “limits of physical performance!” This is surprising because at the present time more and more physical work is being replaced by machines and automation. Previously, man’s physical work capacity was of primary importance in the sense that he was a muscle machine and thus a source of
mechanical energy. 1

If we could discover such an overall purpose a definite purpose for which human beings are capable to perform or if we could discover a human potential greater than more temporary limited achievement, then we would think that purpose would be the goal that should excite dynamic ambition.

Drive is the neural process which impels the individual to certain action in pursuit of specific objectives. It play an important role in human performance and may be the most important key to success, for abilities and physical capacities done may be of little use unless the individual is motivated to devote all his endowments and capacities to their fullest limits in the attainment of specific goals. Superior performance may on the other hand, be impossible to attain if the physical capacity of the body is limited, regardless of motivation. 2


Parents often think that they should give their children a head start in athletics by demanding that they participate in sport at a very early age. It seems that every year, coaches encourage younger and younger children to join organized leagues that may act as "feeder" programs for the more advanced levels. Neither the parents' nor the coaches' attitudes can be substantiated by the literature. There are too many variables both in athletics and in the child's environment, to allow us to predict future achievement on the basis of present performance.³


Many variables, namely such personal qualities as personality, physical characteristic, motivation and motor abilities as well as environmental conditions are regarded as having an interacting influence on an individual's selection of and achievement in various physical activities.

Although it is very easy to measure the limitation of man's performance capacity, the fundamental question is which step in the regulation or transfer of
energy inhibits the organism's physical development? There is a great deal of research on this problem but the results permit only an overview from the standpoint of one of several interrelated disciplines; this is insufficient for obtaining valid answers to the question stated above.⁴

Throughout the years continuous improvements have been seen in athletic skills and techniques, and they enable man to run faster, jump higher, and throw farther. Each year more records are broken and what had been previously considered as impossible, now becomes common place. Results achieved in earlier Olympics would not even qualify for the present Olympics.

So far it has not yet come to this age. But will the way we have been going for years not lead there in the forseeable future? Has it not almost become a matter-of-course to expect new records from one Olympic Games to the next - no longer simply outstanding performances but records. All the media of our technical and restless age are to be employed to achieve

these records, and even higher ones in future: increasingly specialized and extensive training, more and more uncontrollable means and techniques designed to raise performances to a higher level, more and more absolute control by specialists of science, and finally higher and higher grants by the various states for training centres, research institutes, organisations, functionaries, highly qualified and highly paid trainers.5

7 How quality and quantity of physical training increases the range of man's performance capacity and how much of man's adaptability is inherent can be seen in the development of the results in sports, which can be objectively compared with the use of numbers and measurements. Although continuously increasing levels of exercise have been accomplished, thus raising the question as to what are the levels of performance, there has also been scientific progress in research methodology in such fields as biophysics, biochemistry.

cellular physiology and morphology. As a result, our biological knowledge has been vastly improved and it has been increasingly possible to study the limiting steps in man's physical performance capacity.\(^6\)

The will to perform always urges forward and induces progress. The limits reached today shall be moved farther tomorrow. The will to perform is what makes a man enter untrodden territory and confront the unknown. When personal conditions are favourable and environmental conditions are excellent, optimum performance may be turned into maximum performance - into a record. The desire to perform is a basic drive, in-born and active in every person. It is the drive that leads to the development and evolution of natural qualities. The effort it triggers off lead to an improvement of capabilities and to broadening of knowledge thus contributing to perfection of personality.\(^7\)

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Today our modern society in which we live provides us an abundance of opportunity and facility for the indulgence in track and field. Grass and cinder tracks, indoor stadium, an expanding programme of physical education in schools and colleges, coaching schemes and the ample publication of new literature connected with techniques and ideas in training have all done much to generate a general increase in interest in athletics to attract a good number of participants in track and field and to raise the standards in all events.

During the last few decades athletic training, as an object of scientific research, has attracted more scholars from various fields of knowledge than ever before. To mention a few, the most important contributions of sports medicine to the problem of human performance lie, primarily in the area of heart circulation, of the physiology of performance and metabolism in its most extended meaning and more in the physiology and pathology of the apparatus of motion. Theory and practice have soon shown that there are large-scale differences between the possibilities of various organ-systems, with regard to their development
through training and thereby with regard to the physiological limit load that is still reasonable. There is a very clear look of congruence as to functional capability, trainability and purely physical organ stressing for different tissues under intensive training. There is a particularly great divergency between the development capabilities of the heart, the musculature and the passive apparatus of motion. As proven by sports heart research there are scarcely any limits to the trainability of the healthy heart. It possesses a practically unlimited performance reserve, preventing its being overstressed at will and damaging it thereby. It cannot be endangered even by extreme muscle work, because skeletal muscles tire long before there are any problems for the heart. This decisive knowledge has been used to develop those methods of endurance training for runners, cross-country skiers, swimmers and cyclists, serving today as basis of the performance explosion along the long distances. The methods of spiro-ergometrics and telemetrics developed by sports medicine for the control of heart and circulation, which at present, is the only basis for an objective performance assessment, has in the meantime
become an indispensable diagnostic component of clinical cardiology and pulmonology. 

Morehouse and Miller have indicated in their book that variations in the position of the muscular attachments, the structure of the joints, and the length of the bony levers all affect the performance of physical activity. According to them, when the anatomical structure is particularly advantageous for strength, it is disadvantageous for speed, large joints are strong, but they also may limit motion. Long-distance runners are observed to have very flat longitudinal arches, and sprinters have smaller feet and higher arches.

Even though at the present time in many countries occupational activities and those required for daily living have been reduced to the lowest level, ever, it has still been possible to systematically

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stress the human organism with definite objectives in order to obtain a markedly increased range of performances. As the result, high levels of physical performance have been achieved. These achievements were certainly not possible or even conceivable, before the advent of modern training methods. These improvements have been found not only in sports but also in many other fields of human endeavour, eg. space travel, mountain climbing, expeditions, etc. which demand exceedingly high levels of activity.  

What would be the essential differences between the training of yesterday and that of today and tomorrow? We can say in one word "Complexity". It is the complexity of training which has been increasing from time to time.

Despite the vast amount of research that has been done in athletic training, most of what we know have been gained emperically through sweat and tear on the training ground, rather than what has been discovered in the laboratories of human performance, physiology and

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psychology. It is only after training 'method' has been found by coach or teacher or athlete or both that the physiologist and psychologist confirm its worth.

A schedule should always be applied with the specific physical, mental and emotional demands of the individual athlete in mind. For a coach to create or adapt one training system as superior to all others and to impose that method on a number of athletes is just not good enough.

The training for various sports differs, in as much as distance running is different from power performances as in the high jump, shot put, short print, discus throw, etc. Success in such individual events depends on the optimum combination of method, attitude, skill and fitness.

Sometimes, in our mind the question arises regarding how to find out why the outcome of some existing process is not satisfactory? Here, the first task will be to find out exactly what constitutes the desired performance, and in what particulars does it differ from the unsatisfactory product or result.

It is a common practice that the selection
of youngsters for any event in track and field is mainly made by intuition. Of course, there are few published studies which offer a more scientific approach to prediction of future success in track and field. Most of the scientific studies are based on various factors. To mention a few, there are genetic, nutritional, state of health, climate, psychological and type of habitual physical activity and training etc. Therefore, it seems that it would be difficult for the selector to isolate a single factor keeping all others constant in order to know more about each of the variables.

Therefore, research in this area becomes very important when it is realized that all athletic events are considered to be criteria of general body fitness. A fuller understanding of these events is required in order to justify or disqualify their use for these purposes and to aid in establishing training programmes where optimal success will be achieved for each individual participant.
Statement of the Problem

The purpose of the study was to identify the physical, physiological and psychological variables limiting performance in running, jumping and throwing events in track and field.

Delimitations

1. The study was delimited to the male students of ninth, tenth and eleventh classes of the Scindia School, Fort, Gwalior.

2. The present study was confined to the following physical, physiological and psychological variables:

Physical Variables

(a) 50 M. Run (Speed)
(b) Standing Broad Jump (Explosive Strength)
(c) Sit ups (Abdominal Strength)
(d) Pull ups (Arm and Shoulder Circle Strength)
(e) 12-Min. Run (Cardio-respiratory Endurance)
(f) Shuttle Run (Agility)
(g) Sit and Reach (Flexibility of Back and Hamstring)
(h) Shoulder Rotation (Flexibility of Shoulder)

Physiological Variables

(a) Percent Body Fat
(b) Systolic Blood Pressure
(c) Diastolic Blood Pressure
(d) Vital Capacity
(e) Haemoglobin Content
(f) Anaerobic Capacity
(g) Resting Heart Rate
(h) \( \text{Vo}_2 \) Max.

Psychological Variables

(a) Personality Traits
(b) Depth Perception

Limitations

1. The non-availability of sophisticated instruments was accepted as limitation in this study.

2. No motivational technique was employed by the research scholar to enable the students to put up their best performance.
**Hypothesis**

It was hypothesized that physical, physiological and psychological variables chosen in the study would limit the performance in selected track and field events.

**Definitions and Explanation of Terms**

**Speed**

Johnson and Nelson\(^\text{11}\) have defined that speed of movement as the rate at which a person can propel his body or parts of his body through space.

Rapidity with which a movement or successive movements of the same kind may be performed\(^\text{12}\).

Hockey\(^\text{13}\) has defined that speed as the quickness with which one is able to move his body from one point to another.

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For the purpose of this study, the definition of the speed given by Robert V. Hockett was more suitable.

Strength

Strength may be defined as the muscular force utilized in the creation or prevention of movement. In the creation of movement, the force is isotonic (active) in nature, i.e., muscles shorten (concentric contraction) or lengthen (eccentric contraction) as they develop tension, and the force generated is directed towards overcoming a resistance. In the prevention of movement, the force generated by the muscles, often called isometric or static strength, is utilized to resist and equalize the effect of internal or external forces, thereby preventing movement.  

Muscular strength is defined as the contraction force of muscles. Strength is a prerequisite to muscle movement. The components of motor performances depend on some degree of strength, since they all depend on some degree of muscle action. The greater the

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contraction of a muscle, the greater the force exerted, and the greater the strength.\textsuperscript{15}

Strength may be defined as the capacity of the individual to exert muscular force. This force is revealed by the individual's ability to pull, push, lift, or squeeze an object, or to hold the body in a hanging position. Therefore, strength is the prerequisite to all activity since it takes a certain amount to be agile to have power and to run fast.

\textbf{Endurance}

Endurance is the ability of the individual to sustain a work load for a relatively prolonged period.

\textbf{Cardio-respiratory Endurance}

Cardio-respiratory endurance is characterised by moderate contractions of large-muscle groups for relatively long periods of time, during which maximal

adjustments of the cardio-respiratory systems are necessary.¹⁶

**Agility**

Agility may be defined as the physical ability which enables an individual to rapidly change body position and direction in a precise manner.¹⁷

Agility has been variously defined as "Agility to change both rapidly and accurately the position or direction of the body through large range of movement"¹⁸ or "the ability to change direction rapidly and accurately. It depends essentially on strength, speed, of reaction and movement and big muscle coordination."¹⁹

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For the purpose of this study agility is the speed of changing body position and direction.

**Flexibility**

Numerous scholars have defined flexibility as "the range of movement in a joint or a sequence of joints"\(^{20}\) or "the degree one is able to move the joint of the body through their complete range of motion."\(^{21}\)

For the purpose of this study flexibility is the extent of range of movement of articulating body segments around a joint. It is limited by the extensibility of muscles and ligaments surrounding a particular joint.

**Resting Pulse Rate**

Vital capacity is the maximum amount of air which

Measurement of pulse rate when an organism is under complete physical and mental rest can be termed as resting pulse rate.

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The distention of arterial walls at the beginning of the systole ejection of blood is not confined to aorta but travels down the arteries as a wave followed by a wave of recoil. In arteries that lie close to the surface of the body such as the radial artery at the wrist, the arrival of the wave of distention and subsequent recoil may be felt as a distinct throb, the pulse which affords a convenient method of counting the heart rate.\(^\text{22}\)

**Vital Capacity**

The maximal volume of gas that can be expelled from the lungs following a maximal inspiration is called vital capacity.\(^\text{23}\)

Vital capacity is the maximum amount of air which can be transported in one voluntary expiration.\(^\text{24}\)

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\(^{22}\) Morehouse and Miller, *Physiology of Exercise*, p.69.


Cureton defines vital capacity as the maximum volume of air that can be expired after taking full inspiration.

The definition given by Cureton is considered suitable for the purpose of this study.

Blood Pressure

Blood pressure is the pressure exerted on the walls of the arteries as the heart pumps blood through the body. Systolic pressure is obtained when blood is ejected into the arteries; diastolic pressure is obtained when the blood drains from the arteries.

Pulse Rate

Pulse pressure may be determined as the difference between the systolic and diastolic pressure.


26 Clarke, Physical Fitness Research Digest, p.8.

Anaerobic Work

The activity which exceeds the ability of the oxygen transport system to supply the necessary energy. Energy liberated by break down of substances not involving consumption of oxygen is necessary for completion of the activity.28

Maximal Oxygen Uptake ($V\text{O}_2\ Max.$)

The maximal rate at which oxygen can be consumed per minute, the power or capacity of the aerobic or oxygen system. 29

Skinfold Measurements

The skinfold measurements are the measurements taken at selected sites of the human body with the help of skinfold callipers to evaluate the status of adipose tissue.


Haemoglobin

Haemoglobin is a complex molecule found in red blood cells, which contains iron (heme) and protein (globin) and is capable of combining with oxygen.  

Psychological Characteristics

Psychological characteristics are broad personality factors that govern the way one thinks, feels or behaves.

For the purpose of this study psychological characteristics will mean the fourteen psychological dimensions identified by Cattell as descriptive of characteristics influencing behaviour of an individual. The fourteen dimensions are listed below:

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30 Ibid., p.548.


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<td>Q₄</td>
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**Depth Perception**

Depth perception is defined as "the perception of the distance of an object from the observer is the distance from front to back of a solid object."\(^3\)

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For the purpose of this study the term means only one's awareness of the distance between one and the visual perceived object.

Depth perception can occur in various modality.

Depth perception refers to the ability to distinguish the distance of the objects or to make judgements about relative distance. The capacity, also called distance perception, adds the third dimension to height and width.\(^{34}\)

**Significance of the Study**

In our modern time physical education and sport scientists, in general, examine performance in relation to the individual achievement and total fitness. And of course, try to attempt to discover the reasons for the success and then seek to translate these findings into a form that will be useful to others. The results of the study will be of significance in the

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following ways:

1. The findings of this study would add to the existing knowledge in the area for the benefit of those who are concerned with physical education and coaching in sports.

2. The findings of this study will provide guidance to physical education teachers and coaches in screening the athletes in accordance with their inclinations of the events.

3. This study may reveal to what extent the different variables dominate in particular event, so that more attention can be paid for their development during the training programmes.

4. The study will help physical education teachers and coaches in identifying the talent in running, jumping and throwing events in track and field.