Chapter

INTRODUCTION

Soccer has become a very popular game in the world. Almost all the nations play the game both for enjoyment and competition. Modern soccer is very fast by its nature, the spectators and the players enjoy the game of soccer with a great amount of merriment. It is a game of constant action and requires continuous adaptation to changing situations by the team as a whole as well as by the individual players. Although it is a team game, there is ample room for players to display their brilliance through individual performance with the ball as well as through team play involving improvisation and tactical knowledge. It is a game that sends people from all over the world into frenzy, creates National and International heroes too. As like Pele the great, of Brazil, Diego Maradona of Argentina, Zeco of Brazil and the like. As a result, there is a constantly increasing demand for more knowledge and better training means to coach the game. Sports scientists, coaches and physical education teachers are charged with the responsibility of training and teaching their players soccer techniques and tactics, to
develop teams who perform at the maximum level of
effectiveness. Unfortunately we, the Indians still
believe in magic formulas for transforming limited trained
(technically as well as tactically) players into world
class champions. This limitation can only be reached
through the implication of new research findings.

The world of training methodology has crossed
many milestones as a result of different types of researches
in general and their application to the sports development
in particular. In the modern scientific age, athletes are
being trained by highly sophisticated means for better
achievement in their concerned sports. They are being
exposed to the exercises and training methods which have
proved beneficial for achieving higher standards. Much
progress has been made in the recent years in the acquisi-
tion of knowledge about training means and techniques
of sports skills. In sport training specialised exercises
are being prescribed for the fullest and optimum develop-
ment for a particular game.

---

1George Beim, *Principles of Modern Soccer*

2Asha H. Patel, "The Effect of Varied Frequencies
of Speed Training on Sprinting Speed," (Unpublished
In the recent years greater stress has been laid on the quality rather than the quantity of training. The sports scientists and experts of sports want their sportsmen to extract maximum achievement from their training procedures without causing too much strain on them. This is possible only if coaches and teachers of physical education apply the most economical manner for enhancing the performance of athletes.\(^3\)

With the constant demand for "high sports performance" the concept of soccer, to date, has been changed. The concept of "Total Soccer" applies skill development, tactical development, development of all important motor components and physiological parameters which are closely associated and contributes to performance in soccer. Not only the technical, physiological and physical development, the sports scientists are also making efforts to develop the intellectual ability of the soccer players.

The existing literature in the field of soccer shows that endurance, speed, agility, maximum leg strength, upper body strength, leg power, muscular endurance, flexibility, coordination and reaction time are important

\(^3\) Ibid.
pre-requisites for efficient soccer performance.\textsuperscript{4,5,6}

Whereas excess body fat proves to be hindrance.\textsuperscript{7}

To play to his fullest ability, a player must be prepared both mentally and physically to give his best effort throughout the match. This is as true of the professionals playing ninety minutes, as it is of school boys playing short duration matches. To be able to perform


\textsuperscript{5}Subhas Chandra Bandyopadhyay, "Relationship of Selected Anthropometric, Physical Fitness and Motor Abilities to Soccer Skill Performance," (Unpublished Master's Thesis, Jiwaji University, April 1982).


like this, a player must develop his fitness through intensive training. A fit player (technically and tactically) can delay the onset of fatigue during a match and training session and will therefore, perform better. The more tired a player is, the more prone he is to making errors, and a player who makes a lot of errors will often shake his confidence, which all players need to perform well. Fitness will aid them in the proper execution of various techniques as well as in playing. Physical fitness for soccer player can be divided into three areas: endurance, strength and speed. In this context there is a need to explore these three areas, to estimate, how they effect a player's performance, in general and how much importance should be given in developing each of this qualities.

"In soccer it is vital that the players have endurance, for it is useless to dominate a match in the beginning because of superior skill only to lose it

---


eventually because the players become exhausted and can no longer perform well." A lack of endurance results in fatigue which diminishes several elements of good performance such as timing, coordination, reaction time, general alertness and concentration. Since increased endurance delays the onset of fatigue, it therefore improves the overall performance during the match.\textsuperscript{10}

When training soccer teams, coaches and teachers of physical education should concentrate on two types of endurance. The first is general, or cardio-vascular endurance, which enables a player to sustain activity in many of his large muscles and thus withstand the intensity of a full match. The second is local endurance, necessary for a single muscle on localized group of muscles to repeat on sustain contraction. A lack of this type of endurance is noticeable in players who do not yet appear fatigued but begin to suffer from proper execution of skills.\textsuperscript{11}

The specifics of endurance displayed in sports and game (game endurance) and in encounters are preconditioned, first of all, by extreme variety, non-standard competition

\textsuperscript{10}Beim, Principles of Modern Soccer, p. 194-195.

\textit{Ibid.}
actions, as well as by the impossibility of determining accurately and beforehand competition load parameters, in particular, the general duration of competitions. This calls for a reserve of endurance calculated for a possible ultimate range of its display. Many episodes with maximum intensive movements (accelerating when moving about the field, attacking shots or throws etc.) precondition the fact that sports and games and encounters make considerable requirements to the systems of an aerobic power provision. At the same time a big volume of the motor activity, alternated with pauses of relative rest, demand a sufficiently high aerobic productivity of the organism.¹²

Inspite of the fact the endurance is a very important ability for good performance in sports, in India it is usually neglected in training in case of track and field, hockey, 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 e.g., long distance running and swimming. In reality, all the sportsmen, irrespective of their sports need a fairly good level of endurance. Its importance is summarised in the following points:

1. Endurance enables the sportsman to maintain optimum pace and tempo during the competition.

2. Endurance is important for ensuring good quality of the technical skills, e.g., accuracy, precision, rhythm etc.

3. The tactical efficiency in long duration sports depends largely upon the endurance of the sportsman. A football or basketball player, having good endurance can recover faster after short bursts of activity during the competition.

4. The ability to recover faster in between the training sessions is also dependent upon endurance. Sportsman having good endurance, irrespective of their sports can, therefore, take higher weekly loads which are necessary for the improvement of performance.

Strength or the ability to express force, is a basic physical characteristic that determines performance efficiency in sports. Each sport varies in its strength requirements and, in the interest of specificity, we should examine its relationship to speed and endurance. There are three classifications of strength namely, maximum strength, explosive strength and strength endurance.
The last two are most pertinent to sport in general, but maximum strength should, nevertheless, be considered as a measure of the maximum strength component of explosive strength and endurance.\textsuperscript{13}

In sports activities some amount of resistance (if not external then one's own body weight) has to be overcome. The strength therefore, is an important factor on which the sports performance depends. Depending upon the magnitude and type of resistance to be tackled in various sports, the sportsmen of different sports need different levels and types of strength to achieve good performance. The greater, the resistance, the stronger should be the sportsman. Strength is needed not only for competition but also for successfully carrying out the training programmes. A high level of speed, endurance, techniques, tactics and other co-ordinative abilities is impossible if the sportsmen lacks the requisite amount of strength.\textsuperscript{14}

Strength deserves considerable attention for soccer players. Players need to produce power when kicking


a ball for long distance or shooting at the goal, when changing directions against their own momentum or that of an opponent, when accelerating quickly or jumping. Unfortunately, many people associate strength development and weight training with muscle bound individuals who are slow and have very limited flexibility. Research in the area of muscular development has shown this to be a misconception. Soccer players can and must work at improving their strength and power to play more effectively.

The results derived from the regular period of training as practical means of adopting the organism to certain specific demands of sports (soccer). The systems which have been reviewed in this purpose are all involved in the adaptation process or permit adaptation to take place. Some specific effects of training, which illustrate adaptation of the physio-physical system by the increase or decrease of certain functional capacities are listed as follows:

Evidence is available to show that heart muscle increases in size through use. The stroke volume of an athlete (trained) is more compared to an untrained athlete.

Beim, Principles of Modern Soccer, p. 220-221.
The pulse rate at resting condition (basal) in less in trained compared to untrained and it is also evident from the available literature that resting pulse rate is much more less in case of trained than that of an untrained individual.\textsuperscript{16,17} Karpovich\textsuperscript{18} in his work remarks that as a result of training, the bone marrow becomes redder, indicating an increase in the number of red corpuscles, in the trained individual. The training also affects the respiratory system by developing its all functions, resulting a better pulmonary ventilation. His investigation also reveals that muscular system's adaptation occur due to training are, it improves thickness and strength of the muscle, the size of the muscle increases (not number of fibre), capillarization took place, finally muscle improves endurance and better neuro-muscular coordination. These findings are also


suggested by Dick’s\textsuperscript{19} investigation. It should be said here, however, that no one form of training will affect all of these adaptations.

The requirement of speed in soccer is beyond question. The tempo of a soccer game is set not only by how fast individual players run but by how quickly they move the ball around to one another as well as up and down field. How quickly they manage to control the ball and overtake an opponent without any waste of time.

Thus, all the techniques and skill training an individual does can benefit his speed. Therefore, it is need-less to further elaboration of the requirement of speed training for better soccer performance. Keeping these views in mind the present research project excluded the speed training factor.

Thus, along with the development of theory and methods of general sports training, it is necessary to effectively investigate the various aspects of training also because due to too much of peculiarity of each sports, the various important aspects of training can not be fully explored alone by the traditional theory and methods of sports training in general. Certain differential aspects

\textsuperscript{19} Dick, \textit{Sports Training Principles}, p. 130.
and requisites about specific sports training can only be realised when the training procedure is studied at every minute structural level rather than at general level.

In this context, it will be worthwhile to investigate the effects of training schedules dominated by strength and endurance loads along with due consideration to other aspects of performance. That is why the research scholar has made an attempt to explore this field to find out the best suited training programme for physical and physiological adaptation process of soccer players.

Statement of the Problem

The purpose of the study was to compare the effects of training loads dominated by strength and endurance on selected physical and physiological variables of soccer players.

Delimitations

1. The study was delimited to one hundred twenty district level school going male soccer players of Greater Bombay, Maharashtra.
2. To find out the comparative effects of training loads, the study was delimited to the following physical and physiological variables:

**A - Physical Variables:**

i) Speed  

ii) Reaction Time  

iii) Speed of Movement  

iv) Strength  

v) Cardio-respiratory Endurance.  

vi) Flexibility  

vii) Co-ordinating Ability  
  a) Agility  
  b) Balance

**B - Physiological Variables:**

i) Hyman's Cardio-pulmonary Index.  

ii) Body composition.

**Limitations**

1. The subjects chosen for the study were not residential, therefore, differences in daily life, food habits and socio-economic environment were treated as limitation of the study.

2. Non-availability of sophisticated instrument
and measuring techniques was considered as another limitation of the study.

Hypothesis

It was hypothesised that strength and endurance dominated training programmes will bring about differential training effects on selected physical and physiological variables.

Definitions and Explanation of Terms

Speed

Speed may be defined as the capacity of the individual to perform successive movements of the same pattern at fast rate.²⁰

For the purpose of the study, the speed may be defined as the ability of an individual to cover 50-metre of distance with minimum possible time.

Reaction Time

Reaction time is the time elapsing between movement of application of stimulus and moment of

response.\textsuperscript{21}

Reaction time is the delay in time between the presentation of a stimulus and initiation of a volitional response.\textsuperscript{22}

For the purpose of this study, the definition of reaction time given by Morehouse and Miller was found more suitable.

**Speed of Movement**

Speed of Movement is defined as the rate of which a person can propel parts of his body through space.\textsuperscript{23}

Speed of Movement is determined by the reaction time and rate of muscular contraction, i.e., after the presentation of a stimulus how much time is taken to complete a unit movement.


Strength

Mathews\textsuperscript{24} has defined muscular strength "as the force that a muscle or group of muscles can exert against a resistance in one maximum effort."

Explosive Leg Strength

"It is the ability of leg muscle to move the body mass in the shortest period of time." Standing broad jump could be used to measure the explosive leg strength for the purpose of the study.

Flexibility

Flexibility may be defined as the range of movement in a joint\textsuperscript{25}

Flexibility is the ability of a joint to allow maximum possible movement measured in degrees, without undue strained or sprained to articulation, ligaments or muscles.


\textsuperscript{25}Barrow and McGee, \textit{A Practical Approach to Measurement in Physical Education}, p. 112.
Endurance (Cardio-respiratory)

Cardio-respiratory endurance is the ability to continue or persist in the strenuous task involving large muscle groups for long periods of time.\(^{26}\)

Cardio-respiratory endurance is the maximal amount of work that an individual can perform over a period of time.

Agility

The ability to change directions quickly and to control body movements.\(^{27}\)

Speed in changing body position or in changing direction.\(^{28}\) For the purpose of the study this definition was considered best suited.

Static Balance

Static balance may be defined as that physical ability which enables an individual to hold a stationary


\(^{27}\) Ibid., p. 39.

Dynamic Balance

Dynamic balance may be defined as that physical ability to maintain balance during vigorous movement as in walking a fence or leaping from stone to stone while crossing a brook.30

Vital Capacity

The maximum volume of gas that can be expelled from the lungs following a maximal inspiration is called the vital capacity.31

Heart Rate

Heart rate is the frequency of pressure waves per minute propagated along the peripheral radial arteries.32


30 Ibid.,


32 Ibid., p. 122.
Positive Breath Holding

Breath holding is defined as the duration through which one can hold the breath without inhaling or exhaling. Positive breath holding is defined as the duration of holding breath after a full inhalation.

Blood Pressure

Blood pressure is the lateral pressure exerted by the blood on the vessel walls while flowing through it.

Blood pressure is the pressure exerted on the walls of the arteries as the heart pumps the blood through the body.

For the purpose of the study, the definition given by Clarke was considered best suited.

---


Systolic Blood Pressure

The maximal level of arterial blood pressure is called the systolic blood pressure.\(^{36}\)

Diastolic Blood Pressure

The lowest level reached by the arterial pressure is called the diastolic pressure.\(^{37}\)

Maximum Expiratory Pressure

Maximum expiratory pressure is the force that one can eject in breathout and which is measured by the sphygmomanometer under standard condition of measurement.\(^{38}\)

Body Composition

Body composition is composed of two factors: fat tissue and lean body mass. The body fat or skinfold thickness can be measured with the help of skinfold calipers. Lean body mass can be calculated from the total body weight minus the weight of the body's fat. Lean body

\(^{36}\) Ibid., p. 102.

\(^{37}\) Ibid., p. 301.

mass is relatively constant in man, while fat may exhibit considerable variation.  

For the purpose of the study, the lean body mass was considered as the mass of the total body excluding the weight of body fat. The weight of body fat refers to the amount of adipose tissue ties between the skin and underlying tissues and consists of connective or arcolar tissue containing of fat cells:  

Body Density  

The density of the whole body is derived simply by obtaining the total weight in the air divided by the estimated total body volume using the principle of Archimedes — the volume of the body is determined from its displacement of water. The body density can be measured with the help of skinfold measurements. This method is probably the most widely used by all and it is measured with the help of skinfold calipers.  

---  


Significance of the Study.

Competitive soccer demands high level of physical and physiological fitness. In competitive season the soccer players are taxed both physically and physiologically as well as mentally. A well planned and regulated training regime can bring the athlete to his peak performance level by developing physical and physiological conditions and the well conditioned athlete will withstand the wear and tear of a competitive season. Only those trained with proper requisites in terms of loading of paramount factors for the execution of skill, will put in his best according to the demand of the competition. Therefore, the present study will be significant in the following ways:

The study will indicate the effects of soccer training loads dominated by strength and endurance on selected physical and physiological variables.

The study will help the profession by way of highlighting the comparative effect of strength dominated training and endurance dominated training on physical and physiological variables.
The study will throw some light by virtue of scientifically developed training schedule for soccer players in order to bring about optimum development of performance.