Chapter I

INTRODUCTION

Athletic competition represents the classical test of physical, psychological and mental fitness or performance capacity. An individual's performance depends upon the combined results of co-ordinated exertion and integration of a variety of functions. In order to achieve top performance and develop championship qualities, the demands of actual event must be perfectly matched by individual's capabilities.

Optimal performance can only be recorded in a competition. After all, there are no awards offered for world records in training. The athlete prepares to improve his competitive performance and, therefore, all the training is a pursuit towards this end. The concept of periodization implies producing and reproducing the high point of performance in a particular competition. This has become very essential and a rather complex phenomenon in the light of increased numbers of competitions and political, economic and social implications besides the glory of victory attached to each one of such competitions.
Training and competition aim at raising the standard of athletic performance. Competition is the most specific application of training. Competitions are of great significance for the buildup and distinctiveness of the competition performance. Preparatory or build-up competitions are a part of training, whereas main or major competition is an end in itself within one training cycle. Preparatory competitions are intelligently spaced within a training cycle to enable the athlete to progressively achieve his peak performance in main competition. The ultimate aim is to improve the abilities, skills and mental qualities that determine performance and, hence, are important load forms. Nevertheless, a mere practise trial in a training session will not inculcate the mental qualities. The competitions are organised to simulate the actual competitive situations, those put the best demands on the athlete causing development of mental qualities such as aspiration, anxiety, confidence and competitive urge.

During the process of training, one can only simulate the situations similar to the competition, which only approximately correspond to a real competition. It is only in actual competition that an athlete because of his competing experience and it's emotional demands, emerges
more completely exhausted than in training. Consequently, the stimulus conducive for adaptation to high and maximum loading is more effective than that which can be reproduced in training. Competition is the most specific training to assist the athlete to master the emotional excitement and to surpass his current limits of performance. Above all, mental qualities specific to competition can become evident only in difficult contests. It is not unusual to hear of an athlete performing superbly in training yet experiencing disasters in actual competitions. This means that he has failed to master himself in competition, reacting negatively to the insecurity threatened by competition. Once back in the quietness and security of the training situation, all is well again. That is why sometimes we come across unexpected but interesting results of competitions.

Training builds efficiency in body adaptability which enhances body's adjustment while performing an activity requiring maximum or near maximal performance over a considerable period of time. A sound training programme causes functional, biomechanical and morphological changes in the body resulting in adaptation to training

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load. Adaptation process are brought about only by demands which strongly disturb the psychological and physiological balance, that it can only be restored at a higher level or by additional functional reserves.

Adaptation results from a correct interplay of phase of loading and phase of recovery. By using up potentials of function and energy the training session first causes a process of fatigue which temporarily lowers the functional capacity of the athlete. The decisive stimulus which releases the functional and morphological adaptation process occurs primarily during recovery phase. This not only replenishes the spent sources of energy but also regenerates it above the original level which leads to the occurrence of a stage of supercompensation which serves as the basis for the improved performance level. The implication of over-load is necessary to enhance the physical and psychological load tolerance as a result of which the athlete's functional capacity to delay the on-set of fatigue is considerably improved. Ultimately, there is an improved standard of performance.

The psychological changes induced by training occur in almost every system of the body subjected to the specificity of training. In their essence the biochemical
changes are; increased myoglobin content, oxidation of glycogen and fat, increased muscular stores of ATP and PC and glycolytic capacity. The systemic changes are cardiac hypertrophy, bradycardia, increased stroke volume, increased blood volume, changed lactic acid tolerance, skeletal muscle hypertrophy, increased various lung volumes and functional capacity of the lungs. Training also influences body composition, blood cholestrol and triglyceride levels, blood pressure, heat acclimatization and various changes in connective tissues.

As the muscles work, they utilize oxygen from regular blood supply and produce lactic acid and other metaboloits. As long as these two processes continue to operate at basically the same rate, the muscles can continue to work with efficiency. But when there is an imbalance in which the rate of waste product accumulation is comaparatively higher than the oxygen and fuel supply in the body, the homeostasis gets upset and fatigue sets in. In a fatigued condition the reaction time slows down accompanied by stiffening or inability of the muscles to reach


a condition of relaxation. This coupled with a reduced ability to respond to stimulation is one of the factors contributing not only to deterioration of the performance but also to athletic injury.  

As long as the demands in training and all the other demands of daily life are within the capacity of the athlete, the standard of athletic performance remains normal and the athlete produces steadily improved results. The fatigue emerging as a result of training is overcome relatively quickly and in shorter time. It is a normal physiological process which is fundamental to the performance and capacity of the athlete.

Stockard has emphasised that in vigorous sports where physical fatigue is a factor, practice may best be held under conditions of physical fatigue which simulate the actual game conditions. Moreover, an athlete must recognise fatigue and accept it as inevitable (for both athlete and opponent) and then learn to ignore it or at least adopt a callous attitude towards it. A physical output

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can be maintained long after the initial on-set of fatigue symptoms, provided the athlete trains with this end in sight. Specific training improves the aerobic capacity of the athlete which means developed maximal aerobic power and an increased anaerobic threshold. As a result of this an athlete is able to employ a higher fraction of aerobic power with minimum or decreased level of lactic acid in the blood. Training also improves anaerobic capacity thereby improving the glycolytic capacity with increased accumulation of lactic acid. This results in an increased capacity for lactic acid tolerance on the part of the athlete. One who is superior in these qualities than his opponent will certainly perform better.

On the contrary, if total work load is not within the capacity of athlete, it overstresses him, causing a progressively accumulated fatigue-condition. In this situation the performance standard is not fully recovered after training until the causes of over-loading are removed. This disturbs the optimum inter-relation between excitation and inhibition with reference to the activity of the central nervous system which Israel\(^6\) identified as base-dovoid condition (dominance of inhibition processes) and

addisonoid condition (dominance of excitation process) of over-loading.

In relation to human performance fatigue is one of man's most perplexing problems. Bartlett\(^7\) in agreement with other researchers, has stated that the fatigue is a term which is used to cover all those discernable changes in expression of an activity which can be traced to the continuing exercise of that activity under it's normal conditions, which can lead either immediately or after delay, to deterioration in the expression of that activity or more simply to results within the activity that are not wanted.

Quite a number of research studies have been conducted in the area of fatigue and human performance but still much more remains to be explored. Albert\(^8\) reported fatigue to be determinental to subsequent performance improvement but not so in the case of the amount of learning. Johnson\(^9\) couldn't find any significant effects


in overall recognition time by induced fatigue. On the contrary, Sayah\textsuperscript{10} found RT, MT and response time reduction as a result of fatigue.

Singh\textsuperscript{11} noted a decrement in signal detection under varying levels of stress. Burke\textsuperscript{12} concluded that physical exertion does influence the dynamic balance whereas, Marshall\textsuperscript{13} postulated that the kinesthesia deteriorates by preliminary unrelated fatiguing exercise.

It is a matter of great concern that an organism always behaves as an unified whole and not as a series of differentiated parts. What happens in a part effects the


\textsuperscript{11} Arnold Ivan Singh, "The Effect of Four Levels of Stress on Signal Detection Performance Between Active and Sedentary Individuals" Dissertation Abstracts International 38:7 (January 1978): 4028.


whole. Specifically, in the case of athletics, mental demands are constantly in consonance with the physical demands of the activity. In many athletic situations, the performer must first recognise a situation (mental) and then react to it (physical). The fact that a performer is slow to react could be due to several factors one of which may be setting in of fatigue. Assertions as to what levels of physical fatigue enhance performance are unfounded. Davey^{14} reported that it is a common observation that many athletes under apparent influence of fatigue make wrong decisions at a critical stage, thus lowering the standard of their performance.

The present study was undertaken to investigate the effects of varying levels of physical fatigue on selected psychomotor and motor ability components of sportsmen and non-sportsmen.

**Statement of the Problem**

The purpose of the study was to investigate the effects of varying levels of physical fatigue on selected psychomotor and motor ability components of sportsmen

and non-sportsmen.

**Delimitations**

1. The study was delimitated to the students of Lakshmibai National College of Physical Education, Gwalior, who had participated in selected sports viz. basketball, cricket, football, hockey and volleyball at the All India Inter-University Competitions during the years 1985-86 and 1986-87.

2. The non-sportsmen group belonged to Arts College of Greater Gwalior, who had not participated at any level of competition in the sports disciplines mentioned in 1 above.

3. The study was confined to the following selected psychomotor and motor ability components:

   **Psychomotor components:**

   a) Depth Perception
   b) Kinesthetic Perception
   c) Time Sense.

   **Motor Ability Components:**

   a) Running Speed
   b) Agility
   c) Two Hand Co-ordination.
Limitations

1. Lack of sophisticated instruments was considered as a limitation of the study.

2. Non-implication of special motivational techniques, which would have influenced the performance of subjects was recognised as another limitation of the study.

3. As the pulse rate was the criteria to indicate physical fatigue wherein a range of 10 was fixed for each condition, the deviation that might have occurred within the range for each individual was considered as a limitation.

Hypothesis

It was hypothesized that:

1. There will not be significant differences on measures of depth-perception, kinesthetic perception, time sense, speed, agility and two hand coordination of sportsmen and non-sportsmen under varying levels of physical fatigue.

2. There will not be significant differences between sportsmen and non-sportsmen on above mentioned variables under different levels of physical fatigue.
Definitions and Explanations of Terms

Psychomotor Components

The term psychomotor is concerned with voluntary human movement which is observable. Psychomotor components are the components directly associated with muscular action or motor skill, some manipulation of materials and objects, and some act requiring neuromuscular coordination.

Since physical education and sports activities are mainly based upon motor skills, the psychomotor components are of great concern to physical educators and coaches.

Depth Perception

Oxendine has defined depth perception as the "ability to distinguish the distance of objects or to make judgements about relative distances. This capacity, also called as distance perception, adds the third dimension to height and width."

Depth perception is primarily based upon

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binocular vision and is aided by certain visual cues. In motor activities, the success of an athlete depends upon his accuracy in judging the distance and speed of individuals and objects. Specially in ball games the depth perception is strategic to efficient performance.

**Kinesthetic Perception**

Scott\(^{16}\) defined kinesthetic perception as "the sense which enables us to determine the position of segments of the body, their rate, extent, and direction of movement, the position of the entire body, and the characteristics of total body motion."

Howard and Templeton\(^{17}\) have defined kinesthesia as "the discrimination of the positions and movements of body parts based on information other than visual, auditory or verbal."

Kinesthetic perception is referred with motor sense or muscle sense. For the purpose of the study, the Kinesthetic Perception as defined by Howard and Templeton was

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\(^{16}\) G.M. Scott, "Measurement of Kinesthesia" *Research Quarterly* 26:2(1955): 324,

considered more appropriate.

Time Sense

Since the time sense of the subject was measured with the help of electronic time sense apparatus the definition accepted with that reference was that "the time sense is the ability to judge the time period elapsing between on-set and cessation of a stimulus."

Agility

Barrow and Mc Gee\textsuperscript{18} defined "agility as the ability of the body or parts of the body to change directions rapidly and accurately."

Agility is a component of motor ability and determines the successful performance in the motor activities like dual games and ball games.

Running Speed

According to Johnson and Nelson\textsuperscript{19} running speed refers to "the rate at which a person can propel his


body, or parts of his body, through space."

For the purpose of this study speed is the capacity of the individual to perform successive movement of the same pattern at a fast rate.

Two Hand Co-ordination

Co-ordination is the ability of the performer to integrate types of movement into specific patterns. One of the most important factors in the sport skill is concerned with the co-ordination of eyes with either hands or feet. Skillfulness in this area of movement is characterised by control, accuracy and steadiness. For the purpose of this study two hand co-ordination can be defined as the ability to perform movement of specific pattern with both the hands and eyes with control, accuracy and steadiness.

Physical Fatigue

Physical fatigue may be expressed as a state of discomfort and decreased efficiency resulting from prolonged or excessive exertion.

"Fatigue is a term used to cover all those discernable changes in the expression of an activity
which can be traced to the continuing exercise of that activity under its normal conditions, which can be shown to lead deterioration in the expression of that activity or more simply, to results within the activity that aren't wanted. Physical fatigue is not an all-or-none proposition in that it may occur to various degrees. Within the framework of this definition the subjects were fatigued. Fatigue was administered by having the subjects to pedal bicycle ergometer at a prescribed work-load for a set period of time.

Sportsmen

For the purpose of this study sportsmen were the students from Lakshmibai National College of Physical Education, Gwalior, who had participated at All India Inter-University Competitions in selected sports of basketball, cricket, football, hockey and volleyball in the years 1985-86 and 1986-87.

Non-sportsmen

Non-sportsmen were the students from Arts Colleges of Greater Gwalior, who had not participated

\[20\] Singer, Coaching, Athletics and Psychology, p. 213.
at any level of competition in the selected sports.

Significance of the Study

In most of the games and sports a player has to negotiate with an external object like ball, shuttlecock, etc. The negotiation with the object may be either in the form of receiving or releasing the object to a predetermined aim. While doing so it is essential for the player to perceive accurately the distance, direction and trajectory of the object which may travel at a considerable speed so that necessary adjustments must be made to negotiate with it successfully. Besides, player's other qualities consistent with biochemical, physiological and psychological principles, with variations of individuality of the correct form, the perceptual ability is the most important to ensure qualitatively accurate and efficient skill performance. Performance of sportsmen involves complex processes and these processes are gradually affected as the fatigue starts setting.

Therefore, the present study may be of great value in the following ways:

1. The findings of the study may provide information as to which of the selected psychomotor and motor
ability components are affected first by which level of physical fatigue, in case of sportsmen and non-sportsmen.

2. The conclusions drawn may provide some information helpful to simulate the exact training situations to ensure high performance level during competitions.

3. The results of the study may indicate how sportsmen differ from non-sportsmen in performance on given psychomotor and motor ability components under varying levels of physical fatigue.