Chapter I

INTRODUCTION

Application of scientific methods is the order of the day in time with the developments taking place in science and technology, irrespective of the field of activity. Teaching and training of sports and games also witness astounding techniques, tactics and skill developments to bring achievements in the field. Sports and games are highly influential not only in maintaining a spotless healthy life, but also in performing the events with highest level achievement. These two aspects necessitate development of various performance factors. A normal person of good physic should possess the basic fitness components of speed, strength, flexibility, endurance, agility and co ordination as his qualities. The same components are essential for a high level sportsperson. The fitness of technical, tactical and skill levels to the relevant game are systematized and standardized at every moment to make new dimensions in the sports activities and games.

Playing baseball requires short period and in which a player uses maximal power, by swinging the bat, throwing the ball, and sprinting to the base. In playing basketball, ability to jump for a rebound and shoot is very important. Resistance training improves abilities of vertical jumping, grasping the ball and passing too and it improve a player’s shooting range by strengthening his upper body.
muscles. Playing football requires speed, strength, endurance, power and other tactics. The requirement for each position is different and these factors can be improved by resistance training. A gymnast needs high level of strength, power and local muscular endurance to complete movements, retaining body positions, and perform winning routines. Resistance training complements the practice of gymnastic movements by improving strength and endurance. Resistance training can improve the player’s ability to recover from short and high-intensity exercise involved in each rally and to hit shots with greater power and control.

In volleyball, blocking, vertical jumping, passing, and spiking are the skills associated with success. An athlete can enhance vertical jumping ability increasing leg strength, total body strength and power. Resistance exercise can provide positive changes in these physical capabilities (Kraemer and Fleck, 1993).

Athletes need to “make the play” when called on. An athlete’s ability to perform depends on a combination of character, conditioning, athletic ability, practice habits, skill level, and effort. The fastest way to become a better performer in most sports is to set goals to increase strength and power (Epley, 2004).

Today, sports science requires became a scientific training with acquainted advanced technology. A broader base of knowledge on athletics now exists and the same is reflected in training
methodology. Scientific trainings are required to master a variety of skills like sprinting, jumping and dodging which are related to strength, power and speed parameters to enhance the performance. The design of resistance training programmes can help for better adaptation. Variations of performance skills are a challenge, especially, when dealing with well-trained and elite athletes. Training adaptation is the sum of transformation brought about by systematically repeating the exercises.

Training will improve the standard of skill and in turn the overall performance. With a base of athleticism, specific training will be even more purposeful. The basis of training athleticism is rooted in running, jumping and throwing, which encompass the whole spectrum of human movement (Gambetta, 2002).

Event specific strength training, in which the chosen exercises are closely related to the actual movements in a particular performance, is extremely important in the development of track and field events (Voss, 2001).

In addition to the high level of physical fitness components, the powers of vertical, horizontal, anaerobic, elastic, explosive, balance, reaction time and anthropometric parameters, are helpful in improving the motor skills of the athletes. So require these qualities constant and uninterrupted training are required to strengthen the quality of skillful movements. Weight training technique is one of the
important training procedures for developing the quality of the skills through sufficient strength abilities.

Based on the cited literature, the scholar has designed the following three modes of weight training to enhance the athletic performance level.

They are:

1. Combined weight training

2. High force weight training and

3. High power weight training

Skeletal muscle is a marvel of nature, a biological engine capable of generating high force, high speed or high power movements with high energetic efficiency. The molecular basis for this ability is the conversion of chemical energy to mechanical work by the cyclic attachment and detachment of the thick-filament-based myosin motor protein with actin proteins of the thin filament (Vandenboom, 2004).

**Combined Weight Training**

Combined training is a comprehensive training approach that strives to improve all the marked components necessary to allow a sportsman to achieve optimum performance. Each of these components is necessary to achieve optimum physical, physiological
and performance related goals. This training includes the integrated approach of developing speed and power.

A number of training programs have been successful in bridging the gap between strength and power to improve speed, strength and power to improve speed, strength and sprinting speed. Combinations of weight (heavy and light) training, explosive power training and various forms of traditional speed training (Speed endurance, over speed sprint loading) etcetera will improve speed optimal level while running short distance (Dintiman et al, 1998).

**High Force Weight Training**

High Force weight training is a market leader in the design and delivery of powerful development programmes. High Force training can offer you a totally new and proven approach to teambuilding and management development training. Our team building and corporate training activities, games and exercises enable people to achieve realistic goals of learning in an informal atmosphere. All events are personally designed to achieve specific objectives, together with an "Ongoing Training Strategy" used to earth the learning at work and support people’s success.

Pure-Strength training is effectively done with very heavy weight and low repetitions. An easy way to determine whether one is in the strength zone is by ascertaining how fast the resistance travels. In fact speed is not a factor in strength training. The weight should
be heavy enough that the movement is slow. Strength training serves as a base for explosive activity. Most athletes incorporate some form of strength training at some point in their program (Sandler, 2005).

Different load assignments result in different outcomes. High intensities (above 80% of IRM) produce more strength and power gains than do lower intensities (below 80% of IRM), which tend to produce more hypertrophy and endurance (local muscular) gains (Baechle, 1994).

The highest force outputs occur at the slower velocities of concentric muscle contraction, while the lowest force outputs are produced at the fastest velocities of concentric muscle contraction. The maximal power output appears to occur at approximately 30% of the maximal shortening velocity (Knuttgen and Kraemer, 1987).

Heavy – resistance strength training ultimately produces a greater maximum force; the greater force production comes at a cost in time of application. Rate of Force Development (RFD) is of prime importance in the efficient conversion of horizontal kinetic energy to vertical impulse. With allowances for the specific nature of individual jumps there is still much commonality (Kerin, 2002).

**High Power Weight Training**

High power weight training is the amount of time and the amount of force a player uses to perform a given task within a
fraction of a second. High power training is necessary and using resistance makes sense because power is the combination of speed and strength. High Power is the ability to generate force quickly. If explosive lifts are included in the lifting program. Strength is related to power, but it’s not the same thing. Strength has little to do with time, whereas power depends on time. If an athlete develops greater power, this, in turn, enhances his ability to generate both force (strength) and velocity (speed).

“Work fast to be fast” principle is essential in all explosive sports events. High power output exercises for mental and physical focus are recommended. Tissue strength will be gained over a wide range of high-intensity explosive lifts. The main advantage of a high-horse power automobile engine in its acceleration it can get the automobile up to a chosen speed more quickly than a lower-powered engine can.

High-Speed quickness is one’s ability to adjust quickly to the movements of one’s opponent. Ideally, coaches would like to have athletes with outstanding speed and quickness (Dintiman et al, 1998).

Heavy resistance training might actually decrease power output unless accompanied by explosive movements. Although an 85-percent load is used for increasing the force components of power,
a lighter 30 to 60 percent load can be used at an explosive velocity for increasing fast force production (Epley, 2004).

Pure power sits in the middle of the continuum and is the combination of speed and strength. Its production is continual and produced as needed. Power is constantly required whenever there is movement. Sports events that fit the bare power category include those that propel the body through the air such as jumping or throwing heavy objects, such as a shot or hammer. Typically a sport event that requires vertical velocity to propel the body into the air requires both speed and strength. This optimal combination of speed and strength helps the body to develop enough force and velocity to overcome the inertial effects of gravity. Jumping for distance, jump for height, and jumping to block shots in basketball or in volleyball qualify as high-power activities.

Most strength coaches and exercise scientists believe that success in nearly all sport events is determined by the ability of an athlete to generate power. The latest information indicates that working muscles must contract at high speed if power is the goal of the training program. Yet high-speed training has a clear limitation when performed in a resistance-training environment. High-Speed training is necessary and using resistance makes sense because power is the combination of speed and strength. The trick is to find a safe way to combine both (Sandler, 2005).
After studying the above trainings the scholar has concluded that modifications in the trainings will help for enhancing sports performance to the highest level. Modified programmes are given here under:

**Training and Objectives**

1. **Combined weight training** (modified): Involves high force weight training (80% of 1Rm values) for first five weeks then followed by light force weight training of 60% 1RM and 40% 1RM alternatively for remaining four weeks. To bridging the gap between strength and power to elicit greater speed, power and strength performances.

2. **High force weight training** (modified): This training involves heavy weight with 80% of 1RM values. To increase strength, develop power and enhance speed performance.

3. **High power weight training** (modified): This training involves low weight (50% of 1RM values). To increase high velocity (high power) movements in the athletes’ weight training programme for achieving excellence in power, speed and strength parameters.
STATEMENT OF THE PROBLEM

The purpose of the present study was to find out the effect of three different weight training programme on selected variables.

1. The first part of the study was to investigate the effects of high force, high power and combined weight training on selected athletic performance variables (speed, vertical power, horizontal power, leg strength, anaerobic power, elastic power and agility).

2. The second part of the study is to select minimum number of factors, which could bring together the variables of similar characteristics of the combined, high force and high power weight training.

DELIMITATIONS

The study was delimited to the following factors.

1. To achieve the purpose of the study, 60 male subjects were selected at random from Dr. Sivanthi Aditanar College of Physical Education, Tiruchendur, TamilNadu, India. The age of the subjects ranged between 18-25 years. The selected subjects were divided into three experimental groups and a control group with fifteen subjects (n=15) each. Experimental group I (CTG=15) underwent combined weight training, Group II (HFTG=15) underwent high force weight training, Group III
(HPTG=15) underwent high power weight training and Group IV served as control (CG=15).

2. The following dependent variables were selected for this study namely speed, vertical power, horizontal power, anaerobic power, elastic power and agility and they were assessed by 30-meters run, vertical jump, standing broad jump, Margaria Kalaman anaerobic power test, bunny hops and shuttle run (30ft.) respectively. The leg strength was measured by using leg dynamometer.

3. The duration of the training period was restricted to nine weeks and the number of sessions per week was confined to three.

4. The level of significance was fixed at 0.05 level, which was considered to be appropriate.

5. The data were collected prior to and immediately after the training period.

**LIMITATIONS**

The following factors are the limitations of the study since; the researcher could not have control over them.

1. No effort was put in to find out the effect of environmental changes during pre and posttests and the training period. However, dry weather prevailed mostly.
2. Though the subjects were motivated verbally, no attempt was made to differentiate their motivation level during testing and training period.

3. All the subjects were residents and had same food from the same mess. The daily activities (other than training) were almost similar throughout the training period.

4. Previous experience in training was not considered.

**HYPOTHESES**

The hypotheses framed for the present investigation are as follows:

1. There would be a significant improvement on selected dependent variables due to combined weight training, high force and high power weight training.

2. There would be a significant difference on the development of selected dependent variables among the experimental groups.

3. The set of independent variables might be identified with similar characteristics due to the effect three experimental groups.

**SCOPE AND SIGNIFICANCE OF THE STUDY**

Most sports demand a significant amount of strength and power component. It seems reasonable to suggest that appropriate weight training has the potential to enhance sports performance.
weight training is one of the important methods of the overall physical training programme for young athletes. A well-designed and well-supervised weight-training program will be beneficial to young athletes. The aim of the present study is to contribute to the training methods, which are enlisted below:

1. This study will help the coaches to identify the appropriate methods among the three types namely, high force, high power and combined weight training to improve the athletic performance variables of speed, vertical power, horizontal power, leg strength, anaerobic power, elastic power and agility.

2. The findings of the study will be an addition to the existing knowledge in the field.

3. This endeavor may provide better idea for fixing the load in weight training to obtain desired result.

4. The findings of the study would also help the coaches to train the athletes in events of sprints and jumps.

**DEFINITION AND EXPLANATION OF THE TERMS**

**Speed**

Speed is the ability to perform a movement in a short time as far as possible.

**Vertical power**

It is the ability of the legs in jumping vertically upward.
**Horizontal Power**

It is the athletic power of the legs in jumping forward.

**Leg Strength**

It is a maximal force capacity of the leg muscles.

**Anaerobic Power**

It is the ability to get moving quickly for short distances.

**Elastic Power**

The ability of muscle to exert force quickly and to overcome resistance with a high speed of contraction.

**Agility**

Agility is the ability to decelerate, accelerate and change direction quickly while maintaining good body control without decreasing speed.

**Weight Training**

It refers to the use of (barbells, dumbbells, machines, weighted vests, bars, elastic tubing and so on) such equipments for the express purpose of improving athletic performance.

**High Force Weight Training**

High force or Low speed weight training, in which the relative intensity of training is typically 80%, which can result in marked maximum strength gains.
**High Power Weight Training**

High power or high speed weight training involves lifting relatively light loads (50%) as quickly as possible. This type of training can result in superior gains in power output.

**Combined Weight Training**

Combined weight training would use both methods (High force and High power) of training in this study.

**CHAPTER SCHEME**

The thesis consisting of five chapters. The title was introduced in the first chapter and the statement of the problem, hypothesis, significance of the study and definition of the terms are discussed. The next chapter describes the sources of review of related literature. Selection of subjects, variables, units, experimental design, statistical procedure and the effect of various training methods are given in the third chapter. Analysis of data and discussion on findings and discussion on hypothesis are highlighted in the fourth chapter. The thesis is concluded with summary, conclusions with suitable recommendations, which will be useful for further investigation.