CHAPTER I
INTRODUCTION

Physical training entails exposing the organism to a training load or work stress of sufficient intensity, duration and frequency to produce a noticeable or measurable training effect, that is, to improve the functions for which one is training. To achieve such a training effect, it is necessary to expose the organism to an overload (i.e., a stress) that is larger than the one regularly encountered during everyday life. It is a common perception in training environments that "to build up, one must first break down." Admittedly, exposure to the training stress is associated with some catabolic processes, such as break down of glycogen, followed by an overshoot or anabolic response that causes an increased deposition of the molecules that were mobilized or broken down during training.

Today, the molecular mechanisms involved in training responses have started to emerge, but the pictures are still far from complete. As a basis for studying the training process, however, one can safely state that all cells and tissues of the body, regardless of the presence or absence of training, are subjected to some kind of continuous exchange and remodeling. On the cellular level, molecules have a restricted lifetime and are constantly replaced by new molecules of the same kind or by another form of the same molecules if so demanded by current activity level. (Astrand, 2003)

1.1 CIRCUIT TRAINING

During the early stages of strength training, especially with entry-level athlete almost any strength training method or program will result in strength development to some degree. As the athlete develops a strength foundation, however, the coach should

create a specific, periodized strength training program to maximize the athlete's natural abilities. Equally important for coaches to keep in mind is that each athlete has a unique rate of response, reaction, and adaptation to a given method, and therefore, a different rate of improvement. Strength training is a long-term proposition. Athletes do not reach their highest level after four to six weeks from the beginning of the strength training program, but rather during the competitive phase, which is months away from the anatomical adaptation phase.

The goal of the anatomical adaptation phase is to adapt the muscles, and especially their attachments to the bone, progressively to cope more easily with heavier loads during the following training phases. As such, the overall load in training must be increased without athletes experiencing muscle discomfort. The simplest method to consider for the anatomical adaptation is circuit training, mainly because it provides an organized structure and alternates muscle groups. Although circuit training can be used to develop the foundation of strength for the other training phases to come, it can also be used to develop nonspecific cardio respiratory endurance by combining strength and endurance training. Some authors suggest that combining aerobic endurance with strength training during the same phases may seriously compromise the development of maximum strength and power. The claim is that strength training is incompatible with long-distance aerobic training because fast-twitch fibers may adapt to behave like slow-twitch fibers. These studies scientifically validate the theory that planning a long and slow-duration strength and hypertrophy training on the same day will negatively affect adaptation. Short-term adaptation will suffer. However, athletes in sports in which both strength and aerobic endurance are dominant (rowing, kayaking, canoeing, and cross-country skiing) don't have a choice but to train both during the preparatory phase. Some research

suggests the opposite: that certain compatibility exists between strength and endurance training performed at the same time. (Bompa, 2005).

Circuit training was first proposed by Morgan and Adamson (1959) of Leeds University as a method for developing general fitness. Their initial circuit training routine consisted of several stations arranged in a circle (hence the name circuit training) so as to work muscle groups alternately from station to station. As circuit training grew in popularity, other authors began to provide additional information. Perhaps the best book on the market is Circuit Training for All Sports (Scholich, 1992).

A wide variety of exercises and devices can be used in a circuit training routine, such as body weight, surgical tubing, medicine balls, light implements, dumbbells, barbells, and any strength training machines. A circuit may be of short (6 to 9 exercises), medium (9 to 12 exercises), or long (12 to 15 exercises) duration and may be repeated several times depending on the number of exercises involved. In deciding the number of circuits, the number of reps per station, and the load, coaches must consider the athlete's work tolerance and fitness level.

Total workload during the anatomical adaptation phases should not be so high as to cause the athlete pain or high discomfort. Athletes should help determine the amount of work they can perform. Circuit training is a useful, although not magic, method for developing the foundation of strength during the anatomical adaptation phase. Any other training method in which the muscle groups can be alternated can be equally beneficial. The key to any training method used during this phases is the number of exercises, number of exercises, number of reps and sets, and the rest interval. As shown in the following examples, the training methodology used for the anatomical adaptation phase has to be adapted to the physiological profile of the sport (e.g., speed or power vs. a sport

in which endurance has a certain role) and the needs of the athlete. It must also develop most muscles used in that sport. In line with the overall purpose of the preparatory phase, and particularly the goal of anatomical adaptation, exercises should be selected to develop the core area of the body as well as the prime movers.

Circuit training exercises alternate muscle groups, which facilitates recovery. The rest interval between stations can be anywhere from 60 to 90 seconds, with one to three minutes between circuits. Because most gyms have many different apparatuses, workstations, and strength training machines, a wide variety of circuits can be created. This variety constantly challenges the athlete's skills and, at the same time, keeps them interested. Circuit training should not be used as a testing device or to compare athletes. Athlete differences are due mainly to anthropometric differences. Because the speed of performance and the degree of flexion and extension can vary greatly, comparing athletes is unfair. On the contrary, achievements should only be compared with the individual athlete's past performance (Bompa, 2005).

1.2 PRINCIPLES OF CIRCUIT TRAINING

1.2.1 Regularity

The program should be conducted three times a week at a minimum.

1.2.2 Strength Improvement

Individuals should extend themselves at each station by working at the highest possible stress level for the 30-60 second time period.

1.2.3 Muscular Endurance

This is the quality that enables a person to sustain localized muscles group activities for extended periods of time.

1.2.4 Cardio Vascular Improvement

Cardiovascular improvement depends on a minimum of 20-30 minutes of continuous exercise activity which may include alternating the pace between vigorous and moderate exertion. The exercise pace on this course must be with no pauses except when the individual may reach his limit on a particular station. Both circuit and interval portions are designed to include on alternating pace of vigorous and moderate exertion

1.2.5 Agility

It is the ability of the human body to change direction quickly and effectively.

1.3 OVERLOAD PRINCIPLES IN CIRCUIT TRAINING

In circuit training the overload can be produced by:

1. Increasing the number of stations in the circuit
2. Increasing the number of repetitions at each station.
3. Increasing the number of times the circuit is completed.
4. Increasing the speed at each station. So total time required to complete the circuit is decreased

1.4 EFFECT OF CIRCUIT TRAINING

Circuit training may be designed to increase muscular strength and power, muscular endurance, flexibility and to a limited extent, cardio respiratory endurance. However the physiological effects depend to a large extent on the type of circuit that is set up. Circuit consisting only of weight resistance exercise produces substantial gain in strength but only minimal gains in cardio respiratory endurance. Circuit training is an effective training technique for altering muscular strength and endurance, and to a limited extent, flexibility and cardio respiratory endurance. The use of circuit training,

particularly for off – season programs, therefore may be recommended for athletes sports require high levels or muscular endurance, power and endurance and lower levels of cardio respiratory endurance.

1.5 STATEMENT OF THE PROBLEM

The purpose of the study was to find out the effects of different circuit training with yogic practices on selected motor fitness attributes and physiological variables of school girls students.

1.6 OBJECTIVES OF THE STUDY

1. To evaluate the training effects of explosive strength based circuit training with yogic practices on selected variables.
2. To evaluate the training effects of strength endurance based circuit training with yogic practices on selected variables.
3. To evaluate the training effects of combined explosive strength and strength endurance based circuit training with yogic practices on selected variables.
4. To find out the superiority effects of the selected trainings on selected variables.

1.7 HYPOTHESES

1. It was hypothesized that explosive strength based circuit training with yogic practices(ESBC-YP) may produce significant improvement on the selected motor fitness attributes (speed, leg explosive power, flexibility and muscular strength endurance) and physiological variables (resting pulse rate, VO_2 max and breath holding time,), among school girls students.

2. It was hypothesized that strength endurance based circuit training with yogic practices(SEBC-YP) may produce significant improvement on the selected motor fitness attributes and physiological variables, among school girls students.

3. It was hypothesized that combined explosive strength and strength endurance based circuit training with yogic practices(CES-SEBCYP) may produce significant improvement on the selected motor fitness attributes and physiological variables, among school girls students

4. It was hypothesized that combined explosive strength and strength endurance based circuit training with yogic practices may produce significant improvement on the selected motor fitness attributes and physiological variables better than explosive strength based and strength endurance based circuit training with yogic practices among school girl's students.

5. It was hypothesized that explosive strength based circuit training with yogic practices may produce significant improvement on the selected motor fitness attributes and physiological variables greater than combined explosive strength and strength endurance based circuit training with yogic practices and strength endurance based circuit training with yogic practices among school girls students.

6. It was hypothesized that strength endurance based circuit training with yogic practices may produce significant improvement on the selected motor fitness attributes and physiological variables greater than combined explosive strength based and strength endurance based circuit training with yogic practices and explosive strength based circuit training with yogic practices among school girls students.

1.8 SIGNIFICANCE OF THE STUDY

1. The present study will be of great interest and use to physical educators, , coaches and athletes, as they would be able to assess the effects of three different methods of circuit training with yogic practice on selected motor fitness attributes and physiological variables.

2. The study will enable researchers to find out the importance of the selected physiological variables among school girls.

3. The study will enable educators and scientists to find out the importance of the selected motor fitness attributes.

4. This study may stimulate the student's interest in physical activities through the different methods of circuit training with yogic practice.

5. The study will be beneficial to physical educationists and sports scientists who have been constantly examining sports performance in relation to the individual skill and fitness standards and trying to discover those factors that contribute to high performance that could be utilized in the practical aspects of further sport's participation.

6. The finding of the study provides an opportunity to find out the suitable training needed for the development of motor fitness attributes and physiological variables.

7. These findings may be of great help to suggest ways and means in formulating the better training programme to enhance the selected criterion variables.

1.9 DELIMITATIONS

The present study was delimited in the following aspects

1. The study was confined to sixty school girls student from Presidency girl's higher secondary school, Chennai Egmore, Tamilnadu, India and their age was between fifteen to seventeen years.

2. The selected subjects were divided into four equal groups each consisting of 15 subjects i.e., Experimental Group 1, 2, 3 and a Control Group.

3. As far as criterion variables used in the present study were concerned, it was delimited to speed, explosive power, flexibility, muscular strength endurance, resting pulse rate, $VO_{2\ max}$ and breath holding time.

4. In yogic practices the study delimited to asanas, pranayama, and mudra only.

5. The training intervention was delimited to 10 weeks only.(weekly 3 alternative, days,i.e. Monday, Wednesday and Friday)

1.10 LIMITATIONS

1. Certain factors like food habits, life style, daily routine, climatic conditions and the environmental factors which may have an effect on the results of this study were not taken into consideration and hence were treated as limitations of the study.

2. Further no attempt was made to control factors like air resistance intensities of light, atmosphere and temperature during training and testing periods.

3. No special motivational technique was used during testing and training. Therefore the differences that occurred in performance due to lack of motivation was recognized as the limitation of the study.

4. The difference in economic and educational backgrounds of students that affected their performance was also not taken into consideration.

5. Physical maturity which might have taken place during the study period was not taken into consideration.

1.11 OPERATIONAL DEFINITIONS OF THE TERMS

The terminology anticipated to frequent this study is here under defined and explained to avoid misinterpretation and misapprehension.

1.11.1 TRAINING

It is a programme of exercise designed to improve the skills and increase the energy capacity of an athlete for a particular event (Fox 1984)

1.11.2 SPEED

Speed in this study means the capacity of the individual to perform successive movement of the same pattern at a fast rate. (Barrow, 1973)

1.11.3 EXPLOSIVE POWER

Explosive power is the capacity of the individual to release maximum force in the shortest period of time (Singh, 1991)

1.11.4 FLEXIBILITY

It is defined as a functional capacity of the joint through a normal range of motion (Johnson and Stolberg, 1971)

1.11.5 MUSCULAR STRENGTH ENDURANCE

It is defined as the force that muscles or a group of muscles can exert against a resistance on one maximum effect (kenneth, 1993).

1.11.6 RESTING PULSE RATE

The heart beat or heart frequency is defined as the frequency of heart beats in one minute, when a player is in resting conditions (Geddie, 1964).

1.11.7 VO_2 MAX

It means the optimal capacity of the heart to pump blood, of the lungs to fill with larger volumes of air, and of the muscle cells to use oxygen and remove waste products produced during the process of aerobic metabolism. (Jerrold, 2004)

1.11.8 BREATH HOLDING TIME:

The time that elapses between the completion of one inhalation and the starting of that particular exhalation. (Astrand, 2003)

1.11.9 INDEPENDENT VARIABLES

"Main variable is one under consideration that is manipulated by the researcher with subjects randomly assigned to various groups or testing conditions". (Jenson 1979).

1.11.10 DEPENDENT VARIABLES

"A dependent variable is that condition that is observed and measured that is expected to be affected in some way as a result of the manipulation of independent variable" (Morehouse, 1975).