Chapter I

INTRODUCTION

It is true that physical activity has been part of the fundamental pattern of living for every creature that has over lived on earth. For this reason, the condition of a person's body must have always been of great concern. In primitive society there eye, ears to have been very little organised, purposive instruction in physical education, although early people considered that a certain type of fitness was necessary for survival. The usual activities of labour, searching of food, dancing, hunting skills of archery apear and rock thinking and games were essential to the development of superior bodies. With physical efficiency as a basic survival need, auscies including the heart had to be strong, vision had to be keen, body had to move fast and lift heavy loads.¹

Civilization has brought the need for an organised physical education programme as a result of labour serving devices, sendentary pursuits and security, the need has erison for some type of planned programme where by individuals may realise the physical benefits.²

Physical education has made great strides in the middle of the

twenty century. The period from world war II till the middle of the 1970's has been many changes with regard to the role and preparation of physical educators, student involvement, curriculum reform, growth of sports, women liberation and international involvement.

The awareness of physical fitness is a universal phenomenon today.

Physical fitness is a factor which normalises functions, prevents or relieves fatigue and strengthness the body's vital forces. Control functions which includes the collection and processing of information and issuing control commands which requires highly developed sensory and motor functions changed with the development of technology. Man has to carry out these functions in over more diverse and tense conditions, since controlled processes take place at greater speeds demanding quick reactions in the processing of informations as well as maximum concentrarion and observance of a variety of control instrument. This requires a greater professional, physiological and psychological abilities with an optimum amount of motor reactions, physical co-ordination and visual observence.³

Motor fitness is much more than physical fitness. The various components of motor fitness are speed, strength, endurance, egility, flexibility, speed of movement, balance and co-ordination. One of the most important components of motor fitness is muscular strength.

Human strength, the ability to expert muscular force, has been of interest since antiquity and many accounts of super human ability to lift stupendous weights have been recorded. The scientific principle of increasing the load or resistance against which muscles worked as strength increased, has been called progressive resistance exercise and has been employed extensively in modern times by individuals interested in strength development and athletic performance.⁴

The physiological differences between the male and female have dictated the role each will play in our culture. In direct pound for pound comparison with men, however, women face severe limitations because of basic physiological differences. They have smaller hearts, lower total blood volume, lower total blood hemoglobin for oxygen transport, lower power producing mitochondria in the muscle fibres and lower oxygen pulse.⁵

In general, women have more percentage of body fat as compared to men. However, at puberty the differences becomes assertive as female breasts enlarge. The typical girl has about 25 % body fat and a young man 15 %. An average woman has less lean body mass then an average man. Woman also have less bone mass than men of the same height and weight. It is easy to understand why less muscle and more fat per pound of weight in women have negative effect on performance.⁶

⁴ Richard Berger, "affect of varied weight training programs on strength" Research quarterly 33 (May 1962) : 168.
⁵ Betty Weider, "van they still call us the weaker sex?" (April 1982). p. 15.
The basic approaches that have been used to determine the "sex differences" between men and women in terms of muscular strength are in relation to muscle cross sectional area, absolute strength and relative strength.

Human skeletal muscle can generate approximately 3 to 4 kg of force per cm² a muscle cross section regardless of sex. The greatest force is exerted by individuals with largest muscle cross section.

When strength was compared on an absolute score basis, men were usually stronger than women in all muscle groups tested. The exception occurred for trained females (track and field athletes) who significantly increased the strength of specific muscle groups by resistance exercises.⁷

The most remarkable difference between the two sexes was found when comparison was made in the rate of force production. The females, however, produced the maximum force much more slowly, so that the time to reach 70% isometric force level was twice as that of their male counterparts.⁸

Various comparative techniques have been utilised by researchers reporting strength characteristics of men and women. In the case of absolute strength, differences exist between sexes. There is a great deal

---

of variability in the amount of differences. In other studies various means have been utilized to express strength in relative terms. It has been suggested that the trained women athletes may be as strong as untrained men, it has also been stated that the differences in men and women are primarily attributed to differences in body size characteristics. In some cases the results indicate that untrained men remain significantly stronger than well trained women in terms of both upper and lower body strength. Results do indicate that once the differences in upper body strength are adjusted for controlled groups, they do not differ in lower body strength.\(^9\)

Although there is evidence that people of ancient times lifted objects to get stronger, modern day resistance training began in the late 19th century in eastern europe. Early barbells and shorter handled bars called dumbbells were usually fashioned from a solid piece of iron and therefore not adjustable.\(^10\)

Gardiner reveals that the egyptians engaged in a type of training with weight bags, described as "swinging heavy bags like Indian clubs." During holmer's time, the lifting and casting of heavy weights was widely practised by the greeks. In ancient times training with weights had its greatest emphasis during the sixth century b.c. Mile practised weight lifting on most scientific principles with a young bull calf, which he

---

lifted and carried a everyday till it was fully grown. Our own epice have many herculian characters namely bhims, hanuman, etc.

Dudley Allen sargent whose work embraced the field of physical education founded a system of physical training which came to be known as the "sargent system" and which included gymnastic appliances and machines which were designed to produce define localised effects on seperate rate muscle groups.

In 1728, physical training with weight was evaluated by john paugh. During the 19th century there were significant developments in weight training. Weight trainers, especially those in continental europe, had as their predominant goal, development of ther strength. Eugen sandow was probably responsible for the interest in weight scoring renewed in united states after the begining of the present century. During the first world war there was little done in weightlifting.

Under the leadership of bob hoffman weight training and weight lifting began to spread across the continent. 11

Lifting of weight is practised for different reasons. Some individuals participate in this highly specialised from of physical activity because body building is their objective. To those the size of the skeletal muscle is of paramount importance. The aim of body builder is the attainment

of symmetrical hypertrophy of all muscle groups capable of being subjected to maximal shortening against heavy resistance. An athlete can derive a grant deal of strength, speed, power, flexibility and co-ordination through a weight training programme. Weight lifting weight is also used as a from or conditioning exercise for maintaining or improving physical fitness or increasing athletic power in general.\textsuperscript{12}

It is probably safe to say that there are no sports today that do not boost of weight trained athletes. Even distance runners and others to whom economy of body weight is vitally important have found that work with weight training apparatus will improve chronically weak muscle groups and result in better and more injury free performance.\textsuperscript{13}

Weight training is not usually thought as on end in itself, but as a means to an end. The primary objective is not to learn to lift as much weight as possible but to increases strength and power for application to some other sport, weight training may be either isometric contraction, isotonic or isokinetic contraction.

There are some note worthy advantages in training with weights than other type of strength training. Since weights can be added to the bar in small amount it is easy to control the resistance to the working muscles. By recording the amount of weight lifted each day the trainer is

\textsuperscript{12} Frank D. Sills, Weight training in sport and physical education (Washington : Aamper publication, 1962), p. 25.

able to gradually and accurately increases the over load of a muscle group during a workout and from one workout to the next.\textsuperscript{14}

Weight lifting of all types demand wide spread equilibrating postural adjustments and the contraction of synergic and stabilising muscle groups as well as those subjected to training. The activity lends itself readily to systematic progression in the demands made on particular muscle group (perri passu) with improvement in strength and endurance.\textsuperscript{15}

Despite the effectiveness of weight training for athletic and general physical improvement and despite the already large and still growing number of its proponents, many athletes and fitness enthusiasts still shy away from it. They have heard it will make them muscle bound, slow, tight, too heavy or that muscles will turn to fat when they stop training with weights. Even their coaches misinform them that it will run their knees, disrupt their motor patterns and may even give them pre-mature grey hair.\textsuperscript{16}

Consequently this type of training was largely left to weight lifters, body builders, some athletic clubs, few enthusiasts working in the privacy of their own homes.

Earlier strength training was exclusively male preserve. Now the

\begin{footnotesize}
\begin{enumerate}
\item Sills. weight training in sport, p. 26.
\item Reynolds. Complete weight training book, p. 13.
\end{enumerate}
\end{footnotesize}
society has changed. Women have successfully moved into the traditional male dominated.

In fact almost everything has become unisex. Women are discovering their physical capabilities. Myths about the inferiority of women are being questioned. Women are successfully participating in just about all sports and physical activities. Women's quest for athletic excellence have become a facet of their femininity. S west and hard work has become socially acceptable. The prefer to grimace and grind, to squeeze out those final repetitions in weight training program if it gives them results.

One area that women generally shy away from, however is strength training. Many fear that there exercises will develop overly enlarged muscles similar to there observed for men engaged in heavy Weight lifting programmes.

Infeasibly more people are accepting the philosophy that additional opportunities in sport be provided for highly skilled women. As research evidence continuous to support findings, which indicates, that on "all out" physical effort is not harmful to women and that both men and women are physiologically capable of a great deal more than they have achieved in the way of muscular endurance and strength conditioning for high level competition will become more prevalent. As

17. Terilli, Muscle sport, p. 11.
women begin to train more extensively, consideration must be given to safe, yet effective methods, for achieving the desirable effects of training which lead to improved athletic performance.\textsuperscript{19}

Research indicates that for untrained individual not engaged in heavy manual labour or exercise, maximum muscle strength is reached between the ages of 18 and 20, after which it decreases gradually. With increased age and dis-use of the muscles there can be marked reduction in muscular strength.

A decline in muscular strength is associated with reduction of neuro-muscular coordination, reduction in the stability of joints.\textsuperscript{20}

Even though speed appears to be an inherent quality, practice will improve technique and co-ordination, so that speed can be significantly improved. Most weight training advocates feel that there are weight training exercises which will improve speed. Many who do not advocate weight training, claim that it will impede speed and reaction time.\textsuperscript{21}

Many are of the opinion that exercising certain parts of the body will reduce the fat tissue of that particular region. This is erroneous because the muscle being used is fat by the blood stream which is turn draws its supply from the entire body.

\textsuperscript{19} Van Oteghen, Sharan L., "Two speeds of isokinetic exercise as related to the vertical jump performance" The Research Quarterly 46 (March 1975), p. 78.
\textsuperscript{21} Hooks. Application of weight training. p. 22.
Alterations in body composition as a result of high resistance weight training programmes are found to be nearly identical for both men and women. There is an increase in lean body weight and a decrease in total body fat with relatively little change in total body weight.\textsuperscript{22}

The effects of training are widespread and may be observed throughout the body. There are a number of bio-chemical changes occurring at tissue level. Likewise there are a number of systematic changes primarily affecting the circulatory and respiratory system. Finally there are a multitude of other changes such as lowering of blood cholesterol and triglyceride levels and change in body composition. Perhaps the best known changes deals with body composition.\textsuperscript{23}

Consideration difficulties are encountered when writing in this area, as sportsman were trained long before physiology become fashionable and much of the available information had been acquired by trial and error rather than by process of science. When scientific investigations were started they tended to concentrate on matters occurring during exercise, and it is only recently that studies have been made on training methods.

As might be expected the field of physical education and sport has not escaped from serious malaise that has permitted the very fabric

\textsuperscript{22} Christine Clarks Hoppe. "Women can benefit from a weight training program" Journal of physical education and program 80 (September 1984). p. 256.

of society today. We in this field have one of the most blurred images in the entire education system.\textsuperscript{24}

The challenge to physical education, as a vital part of the total educational effort in the years head is of considerable consequence. Never have we achieved the wide spread and general understanding of the true nature and potentialities of physical education, necessary for its full development and function. Some progress is being made as human movement is studied in its fullness.\textsuperscript{25}

While athlete throughout the world are flocking to the gymnasium to build up strength through weight training some of the Indians still feel that lifting weights makes one stiff and muscle bound and they still speak of slim and sleek sprinters.\textsuperscript{26}

Inspite of the progress that has been made in the field of weight training programmes and its physiological impact in the last decade, the information gathered was not sufficient with special references to weight training of women subjects. Besides some characteristics differences of the effect of weight training on males to that of females have been evident.

Therefore in this study the scholar has made a sincere effort to investigate the effect of weight training on selected anthropometric

\textsuperscript{24} Zeigler. Physical Education, p. 29.
\textsuperscript{26} P.K. Mahanand, Hindusthan Times, 30-9-1984.
measurements, motor fitness components and physiological variables of different sexes.

**Statement of the Problems**

The purpose of the study is to determine whether selected weight training exercises had an effect on the selected anthropometric measurements, motor fitness components and physiological variable among middle aged people. The second purpose is to determine the changes that occur during the different stages of the training programme.

**Delimitations**

1. The study is delimited to the middle aged people Aligarh Sports Stadium, Aroyodham health club, etc Aligarh.

2. The study is further delimited to the age group from 35 to 45 years for both the sexes.

3. For the purpose of the study, the following anthropometrical variables, motor fitness components and physiological variable were selected.

**Anthropometric Measurements**

a) Height  

b) Weight  

c) Fore arm Girth  

d) Upperarm Girth  

e) Chest Girth  

f) Waist Girth  

g) Hip Girth  

h) Thigh Girth  

i) Calf Girth
Motor fitness components

a) Leg strength
b) Back strength
c) Grip strength
d) One mile walk/run test

Physiological Variables

a) Vital Capacity  b) Blood Pressure
c) Maximum Breath holding  d) Maximum Expiratory Pressure
e) Pulse Rate  f) Weight of fat
g) Lean body Mass

Limitations

in the absence of availability of latest sophisticated equipments for accurate measurements of some anthropometric and physiological variables the measurements taken are likely to be vitiated by approximation of taking readings and errors due to human perception and handlings.

The diet, health habit, style of daily living on which the scholar had no control was also considered as one of the limitations of this study.

Hypothesis

It is hypothesized that there will not be any significant differences in effect of resistance training on selected anthropometric, motor fitness.
and physiological variables of middle aged people. A significant change will be observed within the same group at different stages of training.

**Definition and Explanation of Terms**

**Weight Training**

Weight Training is defined as those exercises that are designed to strengthen specific muscles by causing them to overcome a fixed resistance, usually in the form of a barbell or dumb-bells.\(^{27}\)

This term refers to the exercises phase of the activity where weight, in the form of barbells and dumb-bells, is used to condition and after the size of various segments of the body. This is, undoubtedly, the most popular phase. Here the underdeveloped individual strives for average or about average size in terms of muscular bulk and body weight and size, the athletes strive for increased strength and condition to become a better performer in chosen sports.\(^{28}\)

**Intensity**

It is the weight percentage used in strength training in relation to maximum performance capacity. Absolute strength indicates the 100 percentage intensity.

**Duration**

It is in terms with total stimulus of the strength for a particular training session. Time utilized in each set may be added to find the sum.

\(^{27}\) Mcardle, Katch and Katch, Exercise Physiology, p. 292.

Density

It is denoted by the recovery intervals in between the sets and also for the change of the exercise.

Number of Sets

Each exercise is performed with a few number of sets for a thorough build up of a particular muscle group.

Isotonic

In the isotonic type of contraction the muscle shortens with varying tension while lifting a constant load.

Isometric

Tension develops but there is no change in the length of the muscle for isometric contraction.

Isokinetic

In Isokinetic constraction the tension developed by the muscle while shortening at constant speed is maximal over the full range of motion.  

Anthropometry

Anthropometry is the science of measuring the size and properties of the human body.

Anthropometric measurements are dimensions of the structure of

---

the human body taken at specific side to give measures of length, girth and width.\textsuperscript{31}

\textbf{Motor Fitness}

Motor Fitness may be defined as an individual's level of standing in terms of his readiness to involve himself in tasks requiring application of such components as speed, strength, endurance, cardio-vascular endurance, agility and flexibility.\textsuperscript{32}

\textbf{Strength}

The force that a muscle or muscle group can exert against a resistance in one maximal effort.\textsuperscript{33}

Explosive strength is "the ability to release maximum muscular force in an explosive manner, that is in the shortest possible time."

\textbf{Speed}

Speed is defined as "rapidity" with which a movement or successive movements of the same kind may be performed.\textsuperscript{34}

For the purpose of this study Speed was considered as the ability to distance in shortest possible time.


\textsuperscript{33} Mathew and Fox, The physiological Basis of physical education, p. 135.

\textsuperscript{34} Clarke, Application of Measurement in physical education, P. 173.
**Speed of Movement**

Speed of movement defined as the rate at which a person can proper his body, or parts of his body through space.\(^{35}\)

**Body Fat**

Fat is the most variable tissue in the body and is distributed throughout the body primarily under the skin and in the abdominal cavity.\(^{36}\)

A compound containing glycerol and fatty acids. One of the basic foodstuffs.\(^{37}\)

**Vital Capacity**

Vital capacity is the maximal volume of air that can be forcefully exhaled from the lungs following a maximal inspiration.\(^{38}\)

Maximal volume of air forcefully expired after maximal inspiration.\(^{39}\)

**Maximum Breath Holding**

The maximum period of time of holding breath followed by maximum voluntary inspiration.

**Maximum Expiratory Pressure**

The maximum pressure exerted by exhaled air which can be held for three seconds after an inhalation.


\(^{36}\) Zelger, physical education and sport, p. 79.

\(^{37}\) Mathew and Fox, The physiological Basis of physical education, p. 636.

\(^{38}\) Larry G. Shever, Essentials of exercise Physiology (Delhi), Surjeet Publication, 1982, P. 61

\(^{39}\) Mathews and Fox, Physiological Basis of Physical Education, P. 647
**Pulse**

Pulse is a wave of distention and recoil after systolic ejections of blood, in the peripheral arteries (e.g. radial artery). Expressed as beats per minute.

**Blood Pressure**

Blood Pressure is the lateral pressures exerted by blood on the vessel walls while flowing through it.\(^{40}\)

The driving force that moves blood through the circulatory system. Systolic pressure is obtained when blood is ejected into the arteries, diastolic pressure is obtained when the blood drains from the arteries.

**Systolic Blood Pressure**

Pressure exerted by blood during the systole.

**Diastolic Blood Pressure**

Pressure exerted by blood during the diastole.

---

\(^{40}\) C.C. Chaterjee, Human Physiology (Calcutta), Medical Allied Agency, March 1980. P. 297
Significance of the Study

The study will be of significance in the following ways:

1. The study will help the physical experts and coaches by highlighting the effects of regular (12 weeks) participation in a weight training programmes on selected anthropometric measurements, motor fitness components and physiological variables of middle aged people.

2. The results of the study will formulate the basis of developing a scientific training programme using weight training as one of the training means in it.

3. The results of the study may help the physical experts and coaches for bringing about desirable changes in selected anthropometric measurements, motor fitness components and physiological variables in accordance with the needs of the people and trainees respectively.

4. The results of the study will reveal the rate of development of the selected anthropometric measurements, motor fitness components and physiological variables among males and female respectively during the total duration of training.

5. The results of the study will help the female athletes, coaches or trainers to have a thorough understanding of the scientific aspect of weight training.