EFFECT OF YOGIC PRACTICE ON PHYSICAL AND PHYSIOLOGICAL VARIABLES AMONG LITERATE AND DROPOUTS (MALE)

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BY
K. SWAMINATHAN

Under the Supervision of
Dr. P. MARIAYYAH

DEPARTMENT OF PHYSICAL EDUCATION
BHARATHIDASAN UNIVERSITY
TIRUCHIRAPPALLI

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Dr. P. MARIAYYAH, Ph.D.,
Retd. Professor and Head,
Department of Physical Education,
Bharathidasan University,
Tiruchirappalli – 620 024.
Tamil Nadu, India.

CERTIFICATE

This is to certify that this thesis entitled **"EFFECT OF YOGIC PRACTICE ON PHYSICAL AND PHYSIOLOGICAL VARIABLES AMONG LITERATE AND DROPOUTS (MALE)"** is a record of research work submitted by **K.SWAMINATHAN** in partial fulfillment of the requirements for the Degree of **"DOCTOR OF PHILOSOPHY IN PHYSICAL EDUCATION"** of Bharathidasan University is done by him under my guidance and supervision and that this thesis or any part thereof has not been submitted elsewhere for any degree.

This is also to certify that the thesis represents the independent work of the candidate.

Place: Trichy.

Date: 27-6-2006.

(Dr. P. MARIAYYAH)
Guide
Dr. P. MARIAYYAH, Ph.D.
PROFESSOR AND HEAD, (Rtd)
DEPARTMENT OF PHYSICAL EDUCATION
BHARATHIDASAN UNIVERSITY,
TIRUCHIRAPPALLI - 620 024

Forwarded

Dr. K. CHANDRASEKARAN
READER & HEAD i/c
DEPARTMENT OF PHYSICAL EDUCATION
BHARATHIDASAN UNIVERSITY
TIRUCHIRAPALLI - 620 024.

Mr. K. SWAMINATHAN, B.A., M.P.Ed., M.Phil.,
Director of Physical Education
S.K. S. S. Arts College,
Thirupanandal – 612 504.
Tamil Nadu, India.

DECLARATION

I hereby declare that this research work entitled, **"EFFECT OF YOGIC PRACTICE ON PHYSICAL AND PHYSIOLOGICAL VARIABLES AMONG LITERATE AND DROPOUTS (MALE)"** is an original piece of research work carried out by me under the guidance and supervision of **Dr. P. MARIAYYAH,** Retd. Professor and Head, Dept. of Physical Education, Bharathidasan University, Tiruchirappalli, Tamil Nadu, India. This work has not been submitted either in whole or in part for any other degree at any other University.

Place: Trichy.

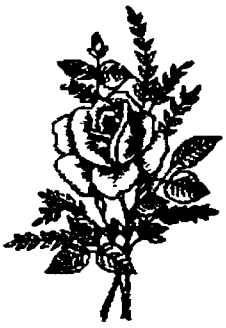
Date: 27 - 6 - 2006.

(Mr. K. SWAMINATHAN)

Investigator.

Dedicated To

My
Beloved Parents
and
Friends



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K. SWAMINATHAN

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INTRODUCTION

Chapter I

INTRODUCTION

"Yoga has complete message for humanity
Yoga has a message for the human body".

- Swami Kuvalayananda

The body is the temple of Soul and to reach a harmony of the mind, body and spirit, the body must be physically fit. The human body is built for physical activity and movement. Throughout the ages, man has had to be physically active in order to procure his daily food to succeed in the battle for survival. Every individual physical activity is essential for harmonious physical and mental development.

Exercise plays a major role in improving the quality and most likely the longevity of our lives. Most people who exercise regularly will agree that one of the main reasons for their exercise is that it makes them feel good, and help them to attain and maintain good health and physical fitness. The effect of regular physical activity significantly improves health, physical fitness and work capacity and enables people to use their leisure time more beneficially and thereby assists in adding life to years and also years to lives.

Fit people make a fit nation. Fitness is that State which characteristics the degree to which a person is able to function more efficiently. Fitness is an individual matter. It implies the ability of each person to live most effectively within his potentialities.

Fitness is that state which characterizes the degree to which a person is able to function efficiently. To lead a happy and successful life, people have to develop physical fitness, because it is necessary for the proper functioning of the body and the system. While fitness is important and functional according to the activity or the game that one undertakes, health becomes a basic necessity to every human being to live best and serve best.

1.1 Yoga

The word yoga is derived from the Sanskrit root yuj. Yoga means to "Yoke", to "Bind", to "Link" to "connect" or to "Merge". Yoga joins body and mind together. The merger of soul with god and the experience of oneness with Him - is yoga. It is possible only through the control over sense organs and through continued practice and detachment. According to the great sage patanjali, "The withdrawal of sense organs from their worldly objects and their control is yoga".[1]

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[1]H.K. Kaul, ***Yoga Aasana for Every one*** (Surjeet publications, Delhi, 1992), p.1.

"Yoga is a system of integrate education of the body, the mind and the inner sprit. It is a way to attain salvation and to get oneself freed from the cycle of birth and death. It's main purpose is the elimination of the forces harmful to the soul".[2]

1.2 Importance of Yoga

The body becomes strong and healthy, excessive fat disappears, the face glows, the eyes are bright and the whole personality radiates, a special charm. The whole body is purified and the mind improves in ability to concentrate other importance are:

- The blood in the different blood vessels is purified through different yogasanas.
- Yogasanas helps the mind to experience tranquility. This is progressive intellectual development because of the calm mind.

1.3 Stages of Yoga

The proper function of the body depends on the several limbs. The absence or the sickness of any one limb affect the health of the whole body. The same principle applies to the study of yoga and its branches.

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[2]N. Ravi, "Yoga Shows the Way for Divine Splendor", ***The Hindu***, 114, No.351, (December 1991), p.16.

Any inadequacy in the study and the perfection of any the eight steps of yoga will not lead to self- realization.

The following are the eight steps as formulated by Patanjali[3].

a) Yama
b) Niyama
c) Asana
d) Pranayama
e) Pratyahara
f) Dharana
g) Dhyana
h) Samadhi.

1.4 Asana

Yogasana are simple actions for keeping the internal and external parts of the body in good health.

The third anga or limb of yoga is asana. Asanas are postures it is astute of complete equilibrium of body mind and spirit. There are literally hundreds of postures in asanas, asanas bring steadiness, agility, flexibility and so on. Thus, asana is one of the ancient yogic practices forming a base for all other practices and plays an important

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[3] Geetha S Iyengar, ***Yoga A Gem For Women***, (New Delhi: Allied Publishers Limited,1997) PP 14-15

role in every kind of yoga sadhana. Asana is a special type of exercise, which is not only physical out also psychological in nature.[4]

1.5 Pranayama

Pranayama means a pause in the movement of breath. In Sanskrit "Prana" means "Breath" and "Ayama" means a "pause". In modern literature on yoga prana, even in the compound pranayama has been often interpreted to mean a "subtle psychic force (or) a subtle cosmic element".[5]

Pranayama is the fourth state of astanga yoga. Pranayama means breath control. There are three important movements in pranayama inhalation of the breath, exhalation of the breath and retention of the breath.[6]

1.6 Breath in Pranayama

Pranayama is not deep breathing. Deep breathing tenses the facial muscles, makes the small and scalp rigid, tightens the chest and applies external force to the intake or release of breath.

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[4]Sourish Bhattacharya, "Mandra of Meditation", ***Indian Express***, LXIII, No.36 (February 1995), p.8.

[5]Kuvalayananda, ***Pranayama,*** (Kaivalyadhama Lonavala, India, 1983), p.35.

[6]Swati Chandani, Rajiv Chandani, ***Yoga for Children,*** (U.B.S. Publisher's Distributes Ltd, New Delhi, 1995), p.28.

During inhalation each molecule, fiber and cell of the body is independently felt by the mind and is allowed to receive and absorb the prana. There are no sudden movements and one becomes aware of the gradual expansion of the respiratory organs and feels the breath reaching the most remote parts of the lungs.

In exhalation the release of breath is gradual and this gives the air cells sufficient time to reabsorb the residual prana to the maximum possible extent.[7]

1.7 Importance of Pranayama

Pranayama is a scientific mental and physical exercise. In this exercise the diaphgram and the abdominal muscles get good exercise by controlled movements and by their alternate contraction and relaxation respectively. The heart, lungs and digestive organs like stomach, liver and the nervous and endocrine system like brain, the spinal cord, spine nerves get the massage and the rejuvenating exercise. It helps to normalize the circulation of blood.

- The body will become light
- Bodily fat will be reduced
- The belly will no longer project

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[7] ***Ibid.***, P.32.

- Memory will grow strong
- The face will look serene
- The voice will turn sweet
- The mind will remain calm and peaceful without any restlessness what so ever.[8]

1.8 Types of Pranayama

There are about 50 types of pranayama which are described in the shastras. The following are the few important pranayamas.

1. Kapalbhati
2. Agnisar
3. Bhastrika
4. Ujjayee
5. Bhramari
6. Nadishodhana
7. Sheetali
8. Sheetakari
9. Surya Bhedan.

Some of these like Bhastrika and Surya Bhedan are useful during winter, while some others like sheetali and sheetakari are specifically advantageous during summer. Others are good for all seasons[9].

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[8]H.K. Kaul, **Pranayama for Health.** (India : Surjeet Publications, 1991), pp.17-18.

[9] Shri.G.L.Anand, Yogasanas and Sadhana, (Delhi; Pustakmahal, 2000) :P.11

1.9 Asanas and Pranayama

Practicing asanas cleanses the body. Just as a goldsmith heats gold in a fire to burn act its impurities, similarity, asanas, by increasing the circulation of fresh blood through the body, purge it of the diseases and toxins which are the consequences of an irregular life style, unhealthy habits, and poor posture. Regular practice of the strengths, twists, bends and inversions, which are the basic movements of asanas, restores strength and stamina to the body. Asanas together with pranayama or the control of breath, rectify physical, physiological and psychological disorders. They have a positive impact on the effects of stress and disease. Among the many ailments that benefit from the practice of asanas is osteoarthritis, high and low blood pressure.[10]

Yoga can condition the muscles of the entire body. This is especially useful in athletics when muscles are developed in the particular area due to its use in a chosen sport. Yoga offers a support system that counteracts the overuse of specific muscle groups. Regular practice of yoga increases the athlete's energy level and one pointed concentration. Athletes are often subject to sore and tense lower backs, tight hamstring, rigid spine, repeated injuries, leading to

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[10]B.K.S. Iyengar, ***Yoga, the path to holistic health,*** (Dorling Kindersley Limited, 2001), p.10.

stress and discomfort. All of this can be addressed by the yogic practice. Yoga offers rest and regeneration as an essential part of yoga postures. Pranayama, and mental concentration techniques help. The athletes' regular training together with this can create well integrated and balanced athletic body and enhance recovery and performance.

Yoga places great importance on methodical relaxation. In sports training, off season is mainly opted for recovery, relaxation and remedial diagnosis along with fitness. During this period, the yogic training plays an important role to recover the body after the competition is over and also to maintain the fitness level. So, yogic exercises are recommended during off - season for the university athletes.[11]

Prana is "vital energy" which includes will power and ambition, while ayama means "stretch, expansion, extension". Pranayama can be described as the "expansion and extension of - energy or life force". Patanjali begins pranayama with the simple movement of breathing, and leads us deeper and deeper inter ourselves by teaching us to observe the very act of respiration. Pranayama has 3 movements,

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[11]V. Mahadevan, "Yoga and Total Health", ***Yoga and sports,*** Vol.XLIX : 8, (March 2004), p.11.

prolonged inhalation, deep exhalation, and prolonged, stable retention all of which have to be performed with precision.[12]

1.10 Asanas and Health

Asanas make your body supples brings alertness to your mind, while soothing your nerves and glands relaxing your brain and maintaining a physical, physiological and emotional balance.[13]

The breathing process is closely related to the rhythms of one physical, mental and emotional life. Knowing the principles that "when the breath is unsteady the mind is unsteady and when breath is calm, the mind is also calm. "Yogis devised pranayama as part of the yogic science so as to employ the breathing process to win mastery over the mind and inhabit its modifications.[14]

1.11 Training

Sports' training is done for improving sports performance. The sports performance, as any other type of human performance, is not the product of one single system or aspect of human personality. On

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[12] ***Ibid.,*** P.30.

[13] ***Ibid.***, P.240

[14] Sadashiv. P. Nimbalkar, ***Yoga for Health and Peace,*** (Yoga Vidhya Niketan, Bombay, 1992), p.247.

the contrary, it is the product of the total personality of the sports person. The personality of a person has several dimensions e.g. physical, physiological, social and psychic. In order to improve sports performance, the social and psychic capacities of the sports person also have to be improved in addition to the physical and physiological ones. In other words, the total personality of a sportsman has to be improved in order to enhance his performance. Sports' training, therefore, directly and indirectly aims at improving the personality of the sportsman. No wonder, therefore, sports training is an educational process.[15]

Scientific training methods and application of basic principles of body mechanics in sports skill have been attributed to the higher level of performance in sports skills. Performance is the combined result of coordinated exertion and integration of a variety of functions. Genetic factor probably plays an important role in an individual's performance. It appears that upto seventy percent of an individual's maximal force, power or capacity is a matter of genetic factor. The environments as well as geographic location too play an important role in performance. Moreover performance to a certain extent

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[15] Hardayal Singh., ***Science of Sports Training,*** (New Delhi: D.V.S. Publications, 1991), PP.13-14.

depends upon the physical and motor fitness qualities in which definite improvement can be achieved through appropriate training.[16]

Performance can be increased or improved to a great extent only by causing biological adaptation and this is possible only through systematic and scientific training. Specificity of exercises and overload principle should be followed in order to enhance the functioning efficiency of the various systems of the body. Numerous training procedures are in practice to improve motor fitness ability at various levels.

According to Fox[17] sports training is a programme of exercise designed to improve the skills and increase the energy capacities of an athlete for a particular event. These basic training procedures will serve better when utilized with modifications suited to individuals or a group dealt with. The training programme should look into improving the performance of the athletes and at the same time should prevent injury from taking place.

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[16] C. Bourchers and R.M. Malina., "Genetics of Physical Fitness and Motor Performance", ***Exercise and Sports Sciences Reviews***, 11 (1999), 3206.

[17] Edward L. Fox., ***Sports Physiology,*** (Philadelphia: Saunders College Publishers, 1984), P.401.

1.12 Physical Fitness Variables

The main components which influence the physical performance of an athlete are strength, speed, agility, endurance, power and coordinative abilities. Action potential depends on natural abilities and at the same time fundamentals act as the foundation for excellence.

Physical fitness is one of the most important factors that determine the performance level of an individual. Sports performance depends largely on physical fitness factors such as strength, speed, endurance, flexibility and various abilities requiring co-ordination. Sports activity is a physical activity which is not possible without these motor abilities. Fitness factors are most important for predicting athletic performance. Natural ability is the promise of potential but fundamentals are the foundation of excellence.[18]

Almost all performances depend on the ability of applying greater force against a resistance. Increased strength will often contribute to better performance. Muscular strength has long been

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[18] Harrison H. Clarke and David H. Clarke , ***Application of Measurements of Physical Education*** (6th Ed), (Englewood Cliffs, New Jersey· Prentice Hall Inc., 1987), P.114.

recognized as an essential element in all physical activities and is generally considered to be a basic component of physical fitness.[19]

Strength is one of the most important components of physical fitness, which affects performance in almost all games and sports in some form or the other. The primary objective in strength training is not to learn to lift as much weight as possible but to increase strength for application to the relevant sport. This is possible only when the coaches and physical education teachers use the correct and most beneficial and economical means to train their sportsmen.[20]

Shoulder strength is depends largely on the energy liberation process in the muscle strength. All movements in sports are caused by muscle contractions and therefore strength is a part and parcel of all motor abilities, technical skills and tactical actions. Strength and strength training therefore assume high importance for achieving good performance in all sports.

Physical strength determines one's abilities capacities and potentialities that an individual does exhibit. There are number of

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[19] Bud Getchell , ***A Way of Life,*** (New York· John Willey and Sons, 1976) P 106

[20] A K Uppal and C R. Alifereti., "Comparative Effect of Different Frequencies of Strength Training on Selected Strength Variables", ***SNIPES Journal,*** 7 1 (1984), P 78

physical exercises and activities which develop arm strength to a great extent. The shoulder strength can be determined by the individuals performance in flexed arm hang for women.

Speed is the important quality for all the game, especially sprinters need high efficient speed. The muscle contraction must be very fast, without speed there is no game. So speed is the necessity for all the players and athletes.[21]

Endurance is the result of physiological capacity of the individual to sustain movement over a period of time.

Endurance is the highly efficient quality for the long distance runners. This is the improvement of long capacity of an individual. This quality needed for long during period games and middle and long distance runners in athletics.

Endurance can be split to cardiovascular endurance and muscular endurance. Cardiovascular endurance training is to develop the efficiency of the heart and lungs so that the blood and oxygen supply to the working muscles is increased. This helps the muscles to

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[21] Yobu, Test Measurement and Evolution, (Madras; Grace Printers, West Mambalam, 1988) p 662

function and reduce fatigue. Muscular endurance is the capacity of the muscle to work for a prolonged time without getting fatigue.[22]

Agility is the ability to change directions quickly and effectively while moving as early as possible at full speed. This quality may be essential to success in certain sports.

Agility is the prominent quality needed for all the sports and games. The ability to change the body parts from one direction to another with a graceful manner will reduce the energy expenditure. And the athlete can achieve desired goals with less difficulty.[23]

Explosive power is seen in quick movement when body weight is propelled either upward or forward.

Power is the ability of the neuromuscular system to produce the greatest possible force in the shortest amount of time. Power is simply the product of muscle force multiplied by the velocity of movement. For athletic purposes, any increase in power must be the result of improvements in either strength, speed, or a combination of the two.

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[22] Harold M. Barrow and Rose Mary McGee, A Practical Approach to Measurement in Physical Education, (Philadelphia : Lea and Fabiger, 1973) P.19.

[23] James S. Bosco and Gustafson F. William, Measurement and Evaluation in Physical Education Fitness and Sports, (England cliffs, New Jersey; Prentice Hall, inc.. 1983) P.12

The advantage of explosive power training is what it "trains" the nervous system. Increase in performance can be based on neural changes that help the individual muscles achieve greater performance capacity. This is accomplished by shortening the time of motor unit recruitment, especially fast twitch fibers, and increasing the tolerance of the motor nervous to increase innervations frequencies. Explosive power results better inter muscular co-ordination as the ability of the agonistic and antagonistic muscles to co-operate to perform a movement effectively.[24]

Muscular strength is the force that can be generated by the musculature that is contracting.[25]

Athletes run fast and constantly change direction quickly. Such athletes are explodes and accelerators as well as revelators. The dynamics of these sports change abruptly: players run fast in one direction suddenly have to change direction with the least loss of speed. Acceleration and deceleration both require a great deal of leg strength. The same muscles used for acceleration (quadriceps,

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[24] Tuder O.Bompa, Periodization Training For Sports (U.S.A. human kinetics, 1999) p162.

[25] James R Morrow, Measurement and Evaluation in Human Performance (United States, Human Kinetics, 1995) p 292.

hamstrings, and calfs) are sued for deceleration, except they contract eccentrically[26].

Speed is one of the most important physical qualities required for successful performance in jumps, especially in the horizontal jump and in the pole vault. The amount of speed required is slightly different in the event due to differing emphasis in the take off. It is said that sprinters are born not made and it is certainly true that natural ability will always play a major role in sports events. However, the standard is high and the competition is so fierce at present that no sprinter can achieve real success without correct techniques and proper training. It has been established that running speed can be improved through training.

The relationship between strength and speed is well known. Speed performance can be improved rapidly by improving the explosive strength of the concerned muscle groups. A decrease in strength always has negative effect on speed performance. Because of the importance of explosive strength and its high trainability most of the times, speed performance is improved by improving explosive strength. Explosive strength further depends on muscle composition, muscle size and muscle co-ordination. It also depends on metabolic

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[26] Tudur O Bompa, Perodisation Training for Sports, p106.

process. Except muscle composition, all other factors can be improved through training.[27]

1.13 Physiological Variables

Physiology is the study of the functions of the normal human body. The physiological trails depend upon the race, geographical and climatic conditions of human beings. Physiology is one of the bio-medical sciences. It deals with the functions of the living organism. The goal of physiology is to gain in right in to the machinery of the human organism the roles and interaction of its parts and the resultant out put of there interactions, i.e. the over all functioning of the organism.[28]

From the physiological variable, the resting pulse rate and the breath holding capacity were taken for this study. The well trained players will have lesser pulse rate at the time of rest. Training brings down the resting pulse rate. The normal pulse rate for a man is around 72 beats/minute. Good athlete will have less than 72 beats/minute.[29]

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[27] Hardayal Singh , PP 85-87

[28]Lawerence, E Morehouse and Accsustus T. Miller ***Physiology of Exercise*** (Saint Louis The C V Mosby year Book Company, 1967), p.279.

[29]Hardayal Sing, ***Science of Sports Training***.(New Delhi, D.V.S. Publications, 1991), pp 86-87.

Muscular Exercise and certain emotional states cause a temporary increase in the number of red cells as a result of an outpouring of concentrated blood from spleen. This may be looked upon as an emergency measure and like that which occurs at high attitudes, is the response of the body to the tissues call for oxygen.

The major function of the red blood cells, also known as erythrocytes, is to transport haemoglobin which in turn carries oxygen from the lungs to the tissues.

In normal man, the average number of red blood cells per cubic millimeter is 5,200,000 (+ 3,00,000) and in normal women 4,700,000 (+ 300,000).

The total mass of red blood cells in the circulatory system is regulated within narrow limits, so that an adequate number of red cells is always available to provide sufficient tissue oxygenation and yet so that the cells do not become so concentrated that they impede blood flow.

The bone marrow of essentially all bones produces red blood cells until a person is 5 years old, but the marrow of the long bones except for proximal portions of the humeral and tibiae becomes quite

fatty and produces no more red blood cells after about 20 years. Beyond this age, most red blood cells are produced in the marrow of this membranous bones, such as the vertebrae, sternum ribs and iliac. Even in these bones, the marrow becomes less productive as eye increases.

Tissue oxygenation is the basic regulator of Red blood cell production. Any condition, that causes the quantity of oxygen transported to the tissues to decrease ordinarily increased the rate of red blood cell production. When a person, becomes extremely anemic as a result of hemorrhage or another condition, the bone marrow immediately begins to produce large quantities of red blood cells. At very high attitudes, where the quantity of oxygen in the air is greatly decreased insufficient oxygen is transported to the tissues and red cell production is considerably increased. It is not the concentration of red blood cells in the blood that controls the rate of red cell production but the functional ability of the cells to transport oxygen to the tissues in relation to the tissue demand for oxygen.

Haemoglobin is a coloured pigment. It is present in blood and binds with red blood cells. It gives red colour to the blood. It is very important in carrying oxygen to various tissue for energy production.

Blood contains plasma and formed elements which about forty five per cent of the blood. When the blood was centrifuged the total volume of formed elements that has been packed in a tube is called packed cell volume.

Heart Rate (HR) is one of the simplest and most informative of the cardiovascular parameters. Measuring it involves simply taking the subject's pulse, usually at the radial or carotid site. Heart rate reflects the amount of work the heart must do to meet the increased demands of the body when engaged in activity. To understand this, we must compare the heart rate at rest and during exercise.

Resting heart rate averages 60 to 80 beats/min. In middle-aged, unconditioned, sedentary individuals, the resting rate can exceed 100 beats/min. In highly conditioned, endurance trained athletes, resting rates in the range of 28 to 40 beats/min have been reported. Your resting heart rate typically decreases with age. It is important to understand that, a relatively slow heart rate, coupled with a relatively large stroke volume. Signifies an efficient circulatory system. During exercise the heart rates of the athletes increased at lesser rate and to a lower level. Hence it is possible for the athlete to do more work and achieve high oxygen consumption before reaching the maximal heart rate.

Statement of the problem

The purpose of the study is to find out the effect of yogi practice on physical and physiological variables among literates and dropouts (male).

Hypotheses

It has been scientifically accepted that any systemic training over a continuous period of time would lead to produce changes on athletic qualities. Based on this concept, the following hypotheses were drawn.

1. There ~~may be~~ is a significant improvement on physical and physiological variables due to the effects of yogic practice on literates and dropouts.

2. There ~~may be~~ is a significant difference on physical and physiological variables between the literates and dropouts.

Delimitations

The following delimitations were considered for this study.

1. To achieve the purpose of the study, thirty literate and thirty-dropout male from Thanjavour District, Tamilnadu were selected as subjects. The age was ranged from 14-17 years.

2. The selected subjects were divided into two groups namely, Group I consist of thirty literate students who were studying tenth, eleventh and twelth standard and Group II consist of thirty dropouts who were completed sixth standard and below were selected randomly as subjects.

3. Group I and II were subjected to yogic training programmes over the period of twelve weeks and five sessions in a week in addition to their regular.

4. The criterion variables selected for this study were arm strength, muscular endurance, agility, explosive power, speed, endurance, systolic and diastolic pressure, and resting pulse rate.

5. The selected criterion variables for the study were assessed by the following standardized test items: arm strength, muscular endurance, agility, explosive power, speed, endurance was tested by AAPHER Youth Fitness Test. Systolic and Diastolic

blood pressure were measured by sphygmomanometer and resting heart rate was estimated by radial pulse method.

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

Limitations

The following limitations were considered while interpreting the results of the study.

1. The previous experience of the subjects in the field of sports and games, which might be influencing on the training and data collection, was not considered.

2. Psychological factors, food habits, rest period, life style etc. could not be controlled.

3. The weather conditions such as atmospheric temperature, humidity and meteorological factors during testing and training period were also not considered.

4. Though the subjects were motivated verbally, no attempt was made to differentiate the motivation level during the period of training and testing.

5. Since the manual operation was made during 50 meter run, the time was recorded in one tenth of a second.

Significance of the study

1. The study will assist many to avoid medicines to make they fit but to make use of one's own physique to feel healthy.

2. The findings of the study may help the individuals to compare and contrast the changes that occur in selected physical and physiological variables before and after the training programmes.

3. The study as such will create significant health awareness among people.

4. The study will promote research and growth in applying choreography in the field of Yoga training.

5. The study will serve as reference to researchers and statisticians to explore new areas in the field of physical fitness.

Definition of the terms

Arm Strength

Arm strength is the maximum force that can be generated with the arms.[30]

Muscular Endurance

The ability of a muscle or group of muscles to overcome resistance or to act against resistance for longer duration under conditions of fatigue or tiredness.[31]

Agility

It is the ability of the human body to change direction quickly and effectively.[32]

Explosive Power

It is the ability of the neuromuscular system to overcome resistance with high speed of contraction where the skeletal lever system accepts and expels at a high velocity viz., a co-ordination of

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[30] Ted A. Bau gartner and Andrew J. Jckson., ***Measurement for Evaluation in Physical Education and Exercise Science*** (4th ed), (Dubuque, IOWA: W.M.C. Brown Publishers, 1991), P.227.

[31] ***Ibid.***, P.86.

[32] Frank Dick., ***Sports Training Principles***, pp 19.

motor units, reflexes, elastic component and contractile component of the muscle.[33]

Speed

The capacity of moving a limb or part of the body's lower system or the whole body with the greatest possible velocity.[34]

Endurance

Harre (1986) defined that endurance is the ability to do sports movements, with the desired quality and speed, under conditions of fatigue.[35]

Systolic blood pressure

Systolic blood pressure is the maximum blood pressure. It occurs during the systolic of the heart. (Range 100-120mm Hg).[36]

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[33] Frank Dick., Carl Johnson and W.H. Paish., ***Strength Training for Athletics*** (London: British Amateur Athletic Board, 1978), P.5.

[34] Frank Dick., ***Sports Training Principles***, P.193.

[35] Hardayal sing, ***"Science of Sports Training"***, (Kalkaji, New Delhi, 1991), p.149.

[36]V. Selvam, ***Anatomy and Physiology,*** (Radhakrishnan Publishers, Bodinayakkanur, 2000), p.87.

Diastolic blood pressure

Diastolic blood pressure is the minimum blood pressure. Occurs during the diastolic of the heart. (Range 60-80mm Hg).[37]

Pulse rate

The number of beats felt in exactly one minute is a pulse rate.[38]

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[37] ***Ibid***, p.87.

[38] ***Ibid***, p.225.

CHAPTER - II

REVIEW OF RELATED LITERATURE

Chapter II

REVIEW OF RELATED LITERATURE

The research scholar had come across several books, periodicals, journals, internet and unpublished thesis while searching for relevant facts and findings that are related to his present study. Such of these facts are given below for a better understanding and to justify his study.

The phrase "Review of Literature" consists of two words "Review" and "Literature". In research methodology the term literature refers to the knowledge of a particular area of any discipline which includes theoretical practical and its research studies.

The literature in any field forms the foundation upon which all future work will be build. If we fail to build foundation of knowledge provided by the review of literature one work is likely to be shadow and that has already done better by some one else.

Gayout states, the breathing exercises of the pranayama have two objects. Firstly, they are physical exercises designed to make the habitual observance of correct breathing easier, just as ordinary

exercises are designed to facilitate the exertion of the complicated movements of our daily existence. Secondly, the may be considered as a medical treatment, which has a most beneficial effect on our Prani body as well as our physical body. If we make up our mind to spend a few minutes every day in doing them, it will not be long before we feel an increase of health and vigour. Some annoying are reduced and sometimes even disappear alltogether. The resistance to disease becomes considerable.[39]

According to **Joshi**[40] Pranayama makes on ideal programme for training of body and mind. He conducted an experiment with criminals of Central Jail. They were given training in Asanas and pranayama for period of 3 months. Remarkable changes were observed in attitudes of mind and body of the criminals. Particularly the balanced mind was development.

Durgalakshmi[41] conducted a study on "Effect of Yogic exercise on selected physiological variables of high school boys, "the groups

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[39]Felix Guyot, ***Yoga the Art and Science of Self Mastery for Success.*** (Delhi : The Universal Book and Stationary Co., 1967), p.88.

[40]L.S. Joshi, ***Yogic pranayama breathing to long life and good health*** (Delhi : Orient paper backs, 1986), pp.176-177.

[41]K.A. Durgalakshmi, "Effect of Yogic exercises to selected physiological variable of high school boys," ***Unpublished Master's Degree Thesis***, University of Madras (May 1989), p.60-61.

consist of 60 students. The result of the study showed that systolic pressure was increased and diastolic pressure remains unchanged after six weeks training of yoga. The score in breath holding time and vital capacity had also improved. It was statistically significant.

She also recommended that the athletes can adopt these exercises and increase the cardio respiratory function, and further, she adds, the yoga can be included in the regulate programme of physical education in the schools and colleges.

Gharote[42] evaluated psychological effect of selected yogic exercises on the adolescent high school boys. He used Wenger's battery of test for studying autonomic balance shifting it towards increased parasympathetic function while encouraging trend was observed in the cardio respirated efficiency. A residual effect of this training was also observed even after discontinuing the practice for a period of 2 months.

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[42]Gharote, "A study of the psychological effects of short term yogic exercises on the Adolescent high school boys" A research report submitted to the Government of India, ministry of education, as a research scholar under the scheme of ***study of yoga and recreation indigenous activities***", 1962, pp.56.

Gharote, Karambelkar and Bhole[43] stated that vital capacity in ml and breath holding time in seconds are measured respectively in 147 and 139 males between the ages 18 & 50 before and after a 3 were of training in 20 asanas, two breathing practices and 3 kriyas at nine yoga camps were held during the year 1959 to 69. In Average increase of 15 seconds in breath holding time was observed after the training period, which was found statistically significant.

Sakthignanavel[44] in his study 30 normal male volunteers had undergone a 12 weeks training course of pranayama, aerobic exercise and pranayama with aerobic exercise. The results shows that the pranayama group marked as higher degree in vital capacity ($p<0.05$). The aerobic group shows greater cardio respiratory endurance and mascular endurance than the groups. But the combined pranayama aerobic group shows a greater improvement in all aspects than the other 3 groups ($p<0.05$).

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[43]M.L. Gharote, P.V. Karambelker and M.V. Bhole "Effect of Yoga Practices on vital capacity", ***Indian journal***, 12:1 and 2, (April 1974), pp.1-4.

[44]D. Sakthignanavel, "Effect of Pranayama with aerobic exercise on Aerobic fitness", ***Yoga Mimamsa***, 32:4, (January 1998), pp.1-12.

Madanmohan et al[45] conducted a study on the effect of yoga training on visual and auditory reaction times (RTs), maximum expiratory pressure (MEP), maximum inspiratory pressure (MIP), 40 mg Hg test, breath holding time after inspiration (BHT insp), breath holding after expiration (BHT exp), and hand grip strength (HGS). Twenty seven student volunteers were given yoga training for 12 breath holding after expiration (BHT exp), and hand grip strength (HGS). Twenty seven student volunteers were given yoga training for 12 weeks. Our results show that yoga practice for 12 weeks results in significant increase in respiratory pressures, breath holding times and HGS.

Moorthy[46] conducted a study on "The effect of selected yogic practices on cardiovascular fitness level of college men and women" His investigation carried out on 10 male and 5 females students of YMCA college, Madras, should significant improvement in cardiovascular fitness after 6 weeks training in yogic practices when measured by Harvard step rest.

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[45]D.D. Madanmohan, et.al., "Effect of yoga training on reaction time, respiratory endurance and muscle strength", ***Indian Journal Physiology and Pharmacology***, 36:4(1992), pp.229-233.

[46]A. M. Moorthy, "The effect of selected yogic practices on cardiovascular fitness level of college men and women", ***Yoga mimamsa*** 27:1 & 2, (1988), pp.1-2.

Lurtha[47] conducted a study on 36 adolescent males who were divided into three equal groups twelve each. Exercise programme or positive breath holding and negative breath holding were assigned at random of two of the three groups and the third serving as control positive breathing holding group practiced Kumbhaka i.e. holding breath after deep slow and full inspiration and negative breath holding group practiced kumbhaka after, slow expiration. Aerobic capacity was measured by the explosive work done by the subjects in leaping six stairs in two steps covering vertical height of 0.87 meter as propounded by Nargaria Kalamon power test. The study proved that practice of pranayama with positive breath holding increases aerobic capacity and practice of pranayama with negative breath holding increases anaerobic capacity.

Channer et al[48] determined that, reported changes in blood pressure during an exercise programme for cardiac rehabilitation following myocardial infarction. Three weeks after they were discharge from the hospital, a sample of 126 patients (90 males and 36 females; average age 56 years; ranging from 39 to 80 years) were

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[47]V. Lurtha, Effect of breath holding on aerobic and anaerobic capacities", ***Yoga mimamsa***, 24:3 (October 1985), p.29.

[48]R.S. Channer, "Changes in hemodynamic parameters following Tai Chi Chuan and Aerobic exercise in patients recovering from acute myocardial infarction", ***Post Graduate Medical Journal***, 72:349, (August 1996), p.351.

randomly divided into three groups : Tachi, aerobic exercise and a non-exercise support group heart rate and blood pressure were recorded before and after each session. At 11 weeks post - discharge, diastolic blood pressure had decreased only in the Tai Chi group ($p<0.01$) significant reductions in systolic blood pressure occurred in both exercise groups (both ($p<0.05$) compared to a control support group.

Gillette and Elsenman[49] in their study determined the effect of intensity controlled exercise on the aerobic capacity of over weight middle-aged women. Thirty eight moderately over weight women, ages 35-57 participated in a 16 week dance exercise programme. Random assignment was made to an experimental group (n=20) in which intensity of exercise was controlled and prescribed, and a control group (n-18) in which exercise was of an intensity typical to commercial aerobic classes. Prior to the onset of training and at the completion of 16 weeks, the following fitness tests were administered. Aerobic capacity expressed as VO_2max, body composition analysis, blood chemistry, blood pressure, resting heart rate. It was concluded that a significant improvement was found in the physical fitness.

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[49]Gillette, P.A., and P.A. Elsenman, "The effect of intensity controlled aerobic dance exercise on aerobic capacity of middle-aged, over weight women", ***papmed, www.geogle.com*** (22nd February, 2003).

The lungs can be developed in the arteries through practice of deep breathing exercises. By pranayama, the lungs will get a proper supply of O_2. There will be an improvement in quality and quantity of blood. The process of metabolism will be carried out in efficient manner.[50]

Yoga achieves the aim of promotive health and preventing diseases by cultivating parasympathetic dominance by reconditioning the neuromuscular systems ascending endocrinal various physiological and bio-chemical parameters. It has been observed that there is an improvement in cardio respiratory parameters by way of decrease in the resting pulse rate and blood pressure and increasing in chest expansion, vital capacity maximum breathing capacity and breath holding time.[51]

Bhole and Karambelkar[52] investigated the effect of three week programme of Hatha Yoga on physical education students, there was seen to be a statistically significant increases of 15 seconds in breath

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[50]M.V. Bhole, "Effect of Kapalabhati on breath holding time", ***Abstracts and Bibliography of Articles on Yoga XII***: 3 (1983), 45.

[51]P.S. Vishwanar, "Modern Physiological Concepts in Yoga Therapy", ***Yoga Mimamsa***, 4:6, (November, 1983), 57.

[52]M.V. Bhole and Karambelkar, "Effect of yoga training on vital capacity and breath holding time", ***Yoga mimamsa***, 14:2 and 4 (April 1971) 19-26.

holding time. The range of increase was seen to be from 10 to 22 seconds.

Dhanraj[53] reported that 6 weeks practice of 15 minute of Hatha yoga daily, produced a statistically significant ($p<0.05$) change in breath holding time. This increase of 12 seconds from 54 seconds to 66 seconds was lost. However, when yoga practice was discontinued after 6 weeks of detraining, the average breath holding time was 57 seconds. Another group practiced the 5BX programme for physical fitness for 6 weeks (of detraining, the average breath holding time was 57 seconds. Another group practiced the 5B X Pro) showed a much smaller yet statistically significant 4 seconds increase in breath holding time.

Kaur and Kang[54] were compare the efficiency of two relaxation techniques (music and breathing exercise) and to see if the addition of Biofeedback has any added advantage over these techniques. Sample consisted of 20 student athletes age 18-25 year, 10 male, 10 female) divided randomly into two groups, one group was trained with

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[53]V.H. Dhanraj, "Effect of Yoga and The 5 BX fitness plan on selected physiological parameters", ***Unpublished Doctoral Dissertation,*** University of Alberta(1974).

[54]Kirandeep Kaur and G.S. Kang, "Comparision of the efficiency of two relaxation techniques with and without EMG Biofeedback supplementation", ***Journal of sports and sports sciences***, 24:4 (October 2001).

breathing exercises where as the other was given music to relax, in the first phase of study. In the second phase of study EMG Biofeedback was added to both the groups. 2 way ANOVA was the tool for statistical analysis. Significant reduction in EMG value of frontalis muscle was observed in all the groups, however BF assisted group showed better result. Moreover, breathing exercises group produced more the muscle group.

Usha et al[55] was find out "The effect of asanas and pranayamas on selected physical and physiological component. The study has been conducted on 120 boy students between age group 12-16 years. Four groups consisting of 30 students each were formed. This study examined which type of yogic group had the maximum effect on the physical and physiological fitness of subjects. Results showed that every type of yogic exercise improves the physical and physiological fitness but training of asanas and pranayamas collectively can produce the best results.

Jayaveera pandian[56] was conducted "A study on outcome between physical exercises and yogic exercises on selected physical

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[55]Usha Lohan, et al., "The effect of asanas and pranayamas on physical and physiological components of boys between age group 12 - 16 years", ***Journal of Sports and Sports Sciences***, 25 : 1 (January 2001).

[56] Jayaveera Pandian, V. "A study on outcome between physical exercises and yogic exercises on selected physical and physiological variables

and physiological during off-season among the sports participants". The selected samples have been tested on Abdominal Muscular Endurance, flexibility, systolic blood pressure, diastolic blood pressure and heart rate. From the 150 samples, 90 samples were further screened and they are divided into 3 groups, each one consisting of 30. The subjects have been tested on the criterian measures. For assessing the physiological variables such as systolic blood pressure, diastolic blood pressure and heart rate, the well established reliable instruments such as phygmo manometer and stethoscope have been used in the study. Further to test the physical variables such as flexibility and abdominal muscular endurance standardized test have been adopted in the study, with the tools of stopwatch and scale. The initial means with final means and testing adjusted means is the primary aim of analysis of covariance. It was done in the present study.

The following conclusions are drawn from the present study.

1. The practicing of yogic exercises method evidenced significant improvement over the physical exercises method and control group in abdominal muscular endurance and flexibility.

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during off-season among the sports participants", ***Unpublished Ph.D thesis***, Bharathidasan University, 2001.

2. There is a definite response of decreasing heart rate to the practice of yogic exercises as compared to the physical exercises and control group.

3. Systolic blood pressure declines significantly in subjects under yogic exercises practice when compared to the control group. Though the decrement is observed, its effect failed to reach the significant level statistically, when compared with subjects under physical exercises.

4. None of the groups (yogic exercises, physical exercises and control) are superior to other in the reduction in the level of diastolic blood pressure.

5. The physical exercises used in the study had no significant effect on the abdominal muscular endurance and flexibility over the control group.

6. The influence of physical exercises is better in reducing the level of heart rate and systolic blood pressure as compared to the control group.

Moorthy[57] conducted a study on minimum muscular fitness of school children of age group six to eleven years and compared the influence of selected yogic exercises and physical exercises on them. In that study, 1000 children (517 boys and 429 girls) from second and eleventh standard attended at three schools in Pune. 90 boys and 90 girls from the failure were randomly allotted to control group. Experimental group I. (physical exercises) and Experimental group II (Yogic group) were undergone the treatment for a period of six weeks. He concludes that both experimental groups showed significant improvement was seen much greater in yogic group than in physical exercise group.

Roy[58] conducted a comparative study of the effect of Asanas and Ballistic exercise of college student of Lakshmibai College of Physical Education, Gwalior. The data was collected in a seven weeks experiment in August to September 1964. The subjects were randomly assigned to two groups. The group 'A' was put under a training programme consisting of five selected Asanas. Group 'B' was put under a training programme consisting of five ballistic exercises

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[57] A.M. Moorthy, "A study on a survey of minimum muscular fitness of school children in the influence of selected yogic and physical exercise on them", ***SNIPES Journal***, 5, No.3, July, 1992, p.1.

[58]Roy Ramesh Chandra, A comparative study of the effects of Asanas and Ballistic Exercise on running broad jump, ***Thesis Abstracts***, L.N.C.P.E., (July 1984), p.4.

analogous to the Asanas. The Asanas and exercises were chosen for their alleged contribution to improved performance in running broad jump. Measurement in running broad jump was taken at the beginning and at the end of experiment.

The mean gains of group 'A' and group 'B' were tested for significance by 't' test. The difference in the gains made by group 'A' and group 'B' was also tested by 't' test. This difference was not found to be significant at the 5 per cent level of confidence. Performance in running broad jump can be improved significantly by both Asanas and ballistic exercises.

Gharote et al [59]report in a study 430 school boys in the age group of 6 to 20 years. Yogic training for three weeks showed an improvement of 36.8% in comparison to 20% improvement in minimum muscular fitness.

Giri[25] using a set of yogic exercises studied the effects of the programme for six weeks on the five test of national physical efficiency. Drive, viz., 80 metre sprint, 400 metre run, Cricket ball throw, pull-ups and running broad jump. He found a significant

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[59]M.L. Gharote, S.K. Ganguly and A.M. Moorthy, "Effect of Yogic training of minimum muscular fitness", ***Yoga – Mimamsa***, XVIII, No.3 and 4, (October and January 1976), p.20.

improvement among the experimental group in all the five sets as a result of yogic training however, when the group discontinued the practice, the yogic exercises for the same period of six weeks the effect was significant lost.

Chowdhury Samarendra[60] the purpose of this study determine the effect of selected Asanas on stride-length in sprinting. The subject were twenty three men students of the Lakshmibai National College of Physical Education, Gwalior. The data was collected in a six-week experiment on commencing from the third week of August 1969. The subjects were randomly assigned to two groups. The group 'A' was selected eight Asanas to improve flexibility of hip, knee and ankle joints. The group 'B' control group. The mean gains, in stride-length made by group 'A' and group 'B' were tested for significance by 't' test. The group 'A' was one percent level of confidence. The difference in gains made by group 'A' over group 'B' was found to be significant at one percent level of confidence. The result of the study under conditions of the experiment, indicate that the length of stride in sprinting might improve significantly by selected Asanas.

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[60]C. Giri, "Yoga and Physical Fitness with Special References to Athletics", ***IATHPER***, 6100, 2 (April 1966), pp.2-6.

Choarote, Karambelkar and Bhole[61] stated that vital capacity in ml and breath holding time in seconds are measured respectively in 147 females and 139 males between ages 18 and 50 before and after a three week of training in 20 Asanas, two breathing practices and three Kriyas at nine yoga camps were held during the year 1959 to 1969. An average increase of 15 seconds in breath holding time was observed after the training period, which was found statistically significant.

Dhanraj[62] studied that the effects of yoga and the 5 Bx fitness plan on selected physiological parameters. The results indicated increase in basal metabolic rate total volume in basal stateeee, T-4 thyreoxine, hemoglobin, blood cell PWC 130, vital capacity, chest expansion, breath holding time and flexibility after yoga training. Decrease in heart rate were also observed. When yogic training was discontinued for six weeks following in treatment a significant decline in the values of PWC 130, flexibility and breath holding time were noticed.

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[61]M.L. Gharote, P.V. Karambelkar and M.V. Bhole, "Effect of Yoga practices on vital capacity", ***Indian Journal***, 12:1 and 2, (April 1974), 1-4.

[62]Hubert Dhanraj, "The Effect of yoga and 5BX fitness plan on selected physiological parameters", ***Unpublished Doctoral Dissertation***, University of Alberta, Edmonton (1974), p.11.

Murugesan, Govindarajan and Bera[63] (2000) conducted a study on the basis of medical officers diagnosis, thirty three (N=33) hypertensives, aged 35-65 years, from Govt. General Hospital, Pondicherry, were examined with four variables viz. systolic and diastolic blood pressure, pulse rate and body weight. The subjects were randomly assigned into three groups. The exp. group-I underwent selected yoga practices, Exp. group-II received medical treatment by the physician of the said hospital and the control group did not participate in any of the treatment stimuli. Yoga imparted in the morning and in the evening with 1 hr/session/day for a total period of 11 weeks. Medical treatment comprised drug intake every day for the whole experimental period. The result of pre-post test with ANACOVA revealed that both the treatment stimuli (i.e., yoga and drug) were effective in controlling the variables of hypertension.

Telles, Reddy and Nagendra[64] (2000) evaluated a statement in ancient yoga texes that suggests that a combination of both "calming" and "stimulating" measures may be especially helpful in reaching a state of mental equilibrium. Two yoga practices, one combining

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[63]R.Murugesan, N.Govindarajulu and TK.Bera, "Effect of selected yogic practices on the management of hypertension", ***Indian J. Physiol. Pharmacol***, 2000, Apr; 44(2): 207-10.

[64] S.Telles, SK Reddy and HR. Nagendra, "Oxygen consumption and respiration following two yoga relaxation techniques". ***Appl. Psychophysiol.*** Biofeedback, 2000; Dec; 25 (4): 221-7.

"calming and stimulating" measures (cyclic meditation) and the other, a "calming" technique (Shavasan), were compared. The oxygen consumption, breath rate, and breath volume of 40 male volunteers (group mean ± SD, 27.0 ± 5.7 years) were assessed before and after sessions of cyclic meditation (CM) and before and after sessions of shavasan (SH). The 2 sessions (CM, SH) were 1 day apart. Cyclic meditation includes the practice of yoga postures interspersed with periods of supine relaxation. During SH the subject lies in a supine position throughout the practice. There was a significant decrease in the amount of oxygen consumed and in breath rate and an increase in breath volume after both types of sessions (2 factor ANOVA, paired t test). However, the magnitude of change on all 3 measures was greater after CM : (1) Oxygen consumption decreased 32.1% after CM compared with 10.1% after SH; (2) breath rate decreased 18.0% after CM and 15.2% after SII; and (3) breath volume increased 28.8% after CM and 15.9% after SII. These results support he idea that a combination of yoga postures interspersed with relaxation reduces arousal more than relaxation alone does.

Raghuraj *et al*[65] (1998) studied heart rate variability (HRV) is an indicator of the cardiac autonomic control. Two spectral

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[65] P.Raghuraj, *et al.*, "Effect of two selected yogic breathing techniques of heart rate variability", ***Indian J. Physiol. Pharmacol***, 1998, Oct; 42(4): 467-72.

components are usually recorded, viz. high frequency (0.15-0.50 Hz), which is due to vagal efferent activity and a low frequency component (0.05 to 0.15 Hz), due to sympathetic activity. The present study was conducted to study the HRV in two yoga practices which have been previously reported to have opposite effects, viz. sympathetic stimulation (Kapalabhati, breathing at high frequency, ie. 2.0 Hz) and reduced sympathetic activity (nadisuddhi, alternate nostril breathing. Twelve male volunteers (age range, 21 to 33 years) were assessed before and after each practice on separate days. The electrocardiogram (lead J) was digitized on line and off-line analysis was done. The results showed a significant increase in low frequency (LF) power and LF/HF ratio while high frequency (HF) power was significantly lower following kapalabhati. There were no significant changes following nadisuddhi. The results suggest that kapalabhati modifies the autonomic status by increasing sympathetic activity with reduced vagal activity. The study also suggests that HRV is a more useful psychophysiological measure than heart rate alone.

Bowman *et al*[66] (1997) in their study assessed that the effects of aerobic exercise training and yoga, a non-aerobic control

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[66] A.J.Bowman, *et al.*, "Effects of aerobic exercise training and yoga on the baroreflex in healthy elderly persons". **Eur. J.Clin. Invest**, 1997, May; 27(5): 443-9.

intervention, on the baroreflex of elderly persons was determined. Baroreflex sensitivity was quantified by the alpha-index, at high frequency (HF; 0.15-0.35 HZ, reflecting parasympathetic activity) and mid-frequency (MF:0.05-0.15 liz, reflecting sympathetic activity as well), derived from spectral andcross-spectral analysis of spontaneous fluctuations in heart rate and blood pressure. Twenty six (10women) sedentary, healthy, normotensive elderly (mean 68 years, range 62-81 years) subjects were studied. Fourteen (4 women) of the sedentary elderly subjects completed 6 weeks of aerobic training, while the other 12 (6 women) subjects completed 6 weeks of yoga. Heart rate decreased following yoga (69 $\pm$ 8 vs. 61 +/- 7 min-1, $P < 0.05$) but not aerobic training (66 + 8vs. 63 +/- 9 min-1, P=0.29). VO2 max increased by 11% following yoga ($P< 0.01$) and by 24% following aerobic training ($P < 0.01$). No significant change in alpha MF (6.5 $\pm$ 3.5 vs 6.2 $\pm$ 3.0 ms mmHg-1, P = 0.69) or alpha IIF (8.5 $\pm$ 4.7 vs 8.9 $\pm$ 3.5 ms mmHg-1, $P < 0.01$) but not alpha MF (6.5 $\pm$ 3.0 vs 7.6 $\pm$ 2.8 ms mmHg-1, P - 029) increased. Short-duration aerobic training does not modify the alpha-index at alpha MF or alpha HF in healthy normotensive elderly subjects, alpha HF but not alpha MF increased following yoga, suggesting that these parameters are measuring distinct aspects of the baroreflex that are separately modifiable.

Telles *et al*[67] (1997) studied the heart rate, breathing rate, and skin resistance were recorded for 20community home girls (Home group) and for 20 age-matched girls from a regular school (School group). The former group had a significantly higher rate of breathing and a more irregular breath pattern known to correlate with high fear and anxiety, than the school group. Skin resistance was significantly lower in the school group, which may suggest greater arousal, 28 girls of the Home group formed 14 pairs, matched for age and duration of stay in the home. Subjects of a pair were randomly assigned to either yoga or games groups. For the former emphasis was on relaxation and awareness, whereas for the latter increasing physical activity was emphasized. At the end of an hour daily for six months both groups showed a significant decrease in the resting heart rate relative to initial values (Wilcoxon paired sample rest) and the yoga group showed a significant decrease in breath rate, which appeared more regular but no significant increase in the skin resistance. These results suggest that a yoga program which includes relaxation, awareness, and graded physical activity is a useful addition to the routine of community home children.

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[67] S.Telles, *et al.*, "Comparison of changes in autonomic and respiratory parameters of girls after yoga and games at a community home". ***Percept Mot. Skills***, 1997 Feb; 84(1): 251-7.

Raju *et al*[68] (1997) examined the short-term effects of 4 weeks of intensive yoga practice on physiological responses in six healthy adult female volunteers were measured using the maximal exercise treadmill test. Yoga practice involved daily morning and evening sessions of 90 minutes each. Pre and post-yoga exercise performance was compared. Maximal work output (Wmax) for the group increased by 21% with a significantly reduced level of oxygen consumption per unit work but without a concomitant significant change in heart rate. After intensive yoga training, at 154 Wmin (-1) (corresponding toWmax of the pre-yoga maximal exercise test) participants could exercise more comfortably, with a significantly lower heart rate ($P < 0.05$), reduced minute ventilation ($P < 0.05$), reduced oxygen consumption per unit work ($P < 0.05$), and a significantly lower respiratory quotient ($P < 0.05$). The implications for the effect of intensive yoga on cardio-respiratory efficiency are discussed, with the suggestion that yoga has some transparently difference quantifiable physiological effects to other exercises.

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[68] P.S.Raju, *et al.*, "Influence of intensive yoga training on physiological changes in 6 Adult women". A case report, ***J. Altern. Complement Medical***, 1997. Fall; 3(3): 291-5.

Scholl and Allolio and Schonooke[69] (1994) examined the physiological and psychological effects of Hatha-Yoga exercise in healthy women. Hatha-Yoga has become increasingly popular in western countries as a method for coping with stress. However, little is known about the physiological and psychological effects of yoga practice. We measured heart rate, blood pressure, the hormones cortisol, prolactin and growth hormone and certain psychological parameters in a yoga practicing group and a control group of young female volunteers reading in a comfortable position during the experimental period. There were no substantial differences between the groups concerning endocrine parameters and blood pressure. The course of heart rate was significantly different, the yoga group had a decrease during the yoga practice. Significant differences between both groups were found in psychological parameters. In the personality inventory the yoga group showed markedly higher scores in life satisfaction and lower scores in excitability, aggressiveness, openness, emotionally and somatic complaints. Significant differences could also be observed concerning coping with stress and the mood at the end of the experiment. The yoga group had significant higher scores in high spirits and extraverted ness.

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[69]F.J.Scholl, B.Allolio and OW.Schondoke, "Physiological and psychological effects of Hatha-Yoga exercise in healthy women", ***International Journal of Psychosom***, 1994; 41(1-4): 46-52.

Bhargava, Gogate and Mascarenhas[70] (1988) examined the effect of autonomic responses to breath holding and its variations following pranayama. Autonomic responses to breath holding were studied in twenty healthy young men. Breath was held at different phases of respiration and parameters recorded were Breath holding time, heart rate systolic and diastolic blood pressure and galvanic skin resistance (GSR). After taking initial recordings all the subjects practiced Nadi-Shodhana Pranayama for a period of 4 weeks. At the end of 4 weeks same parameters were again recorded and the results compared. Baseline heart rate and blood pressure (systolic and diastolic) showed a tendency to decrease and both these autonomic parameters were significantly decreased at breaking point after pranayamic breathing. Although the GSR was recorded in all subjects the observations made were not conclusive. Thus pranayama breathing exercises appear to alter autonomic responses to breath holding probably by increasing vagal tone and decreasing sympathetic discharges.

Sundar *et al*[71] (1984) in their study assessed twenty five patients of essential hypertension were studied. Of these, 20 patients

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[70] R.Bhargava, MG Gogate and JF.Mascarenhas, "Autonomic responses to breath holding and its variations following pranayama" ***Indian J. Physiol. Pharmacol***, 1988, Oct-Dec; 32(4): 257-64.

[71] S.Sundar *et al.*, "Role of Yoga in management of essential hypertension", ***Acta Cardiol***, 1984; 39(3): 203-8.

were not given any antihypertensive drug treatment (Group A); other 5 had to be put on antihypertensive drugs before including them in the study (Group B). These patients were demonstrated "Shavasana" and trained to perform it correctly. Shavasana therapy was continued for six months. There was a statistically significant fall in both mean systolic and diastolic pressure of both groups. Further, there was a significant reduction in doses of antihypertensive drugs, being given to patients of group B. In 65 % patients of group A, blood pressure could be controlled with Shavasana only and no drug was needed in them at all. Blood pressure rose significantly to pre-Shavasana levels in patients who left practicing yoga. Thus, with the use of yoga (Shavasana) in therapy of hypertension, requirement of antihypertensive drugs may be significantly decreased and in some cases may be totally dispensed with and it may be an useful adjunct in treatment of hypertension.

Damodaran *et al*[72] (2002) studied the effect of yoga on the physiological, psychological well being, psychomotor parameter and modifying cardiovascular risk factors in mild to moderate hypertensive patients. METHODS: Twenty patients (16 males, 4 females) in the age

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[72] A.Damodaran, *et al.*, "Therapeutic potential of Yoga practices in modifying cardiovascular risk profile in middle aged men and women; ***J. Assoc. Physicians India.***, 2002 May; 50(5): 631-2.

group of 35 to 55 years with mild to moderate essential hypertension underwent yogic practices daily for one hour for three months. Biochemical, physiological and psychological parameters were studied prior and following period of three months of yoga practices, biochemical parameters included, blood glucose, lipid profile, catecholmines, MDA, Vit. C. Cholinesterase and urinary VMA. Psychological evaluation was done by using personal orientation inventory and subjective well being. Results showed decrease in blood pressure and drug score modifying risk factors i.e. blood glucose, cholesterol and triglycerides decreased overall improvement in subjective well being and qualify of life. There were decrease in VMA catecholamine, and decrease MDA level suggestive decrease sympathetic activity and oxidant stress. Yoga can play an important role in risk modification for cardiovascular diseases in mild to moderate hypertension.

Kamel *et al*[73] (2000) examined the changes in brain waves and blood levels of serum cortisol during yoga exercise in 7 yoga instructors and found that alpha waves increased and serum cortisol

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[73] T.Kamel, *et al.*, "Decrease in serum cortisol during Yoga exercise is correlated with alpha wave activation", ***Percept Motor Skills***, 2000; Jun; 90(3 Pt 1): 1027-32.

decreased. These two measures were negatively correlated (r = - 0.83). Comparison with a control group of non-practitioners is desirable.

Manchanda *et al*[74] (2000) evaluated the possible role of lifestyle modification incorporating yoga on retardation of coronary atherosclerotic disease. In this prospective randomized, controlled trial, 42 men with angiographically proven coronary artery disease (CAD) were randomized to control (n = 21) and yoga intervention group (n = 21) and were followed for one year. The active group was treated with a user-friendly programme consisting of yoga, control of risk factors, diet control and moderate aerobic exercise. The control group was managed by conventional methods i.e. risk factor control and American Heart Association Step I diet. RESULTS: At one year, the yoga groups showed significant reduction in number of anginal episodes per week, improved exercise capacity and decrease in body weight. Serum total cholesterol, LDL cholesterol and triglyceride levels also showed greater reductions as compared with control group. Revascularisation procedures (coronary angioplasty or bypass surgery) were less frequently required in the yoga group (one versus eight patients; relative risk – 5.45; P – 0.01). Coronary angiography repeated at one year showed that significantly more lesions regressed

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[74] SC Machanda *et al.*, "Retardation of coronary atherosclerosis with Yoga lifestyle intervention", ***J. Assoc. Physicians India***, 2000, Jul; 48: 687-94.

(20% versus 2%) and less lesions progressed (5% versus 37%) in the yoga group (chi-square = 24.9; P < 0.0001). The compliance to the total programme was excellent and no side effects were observed. Yoga lifestyle intervention retards progression and increases regression of coronary atherosclerosis in patients with severe coronary artery disease. It also improves symptomatic status, functional class and risk factor profile.

Mahajan, Reddy and Sachdeva[75] (1999) conducted a study on The effect of yogic lifestyle on the lipid status was studied in angina patients and normal subjects with risk factors of coronary artery disease. The parameters included the body weight, estimation of serum cholesterol, triglycerides, HDL, LDL and the cholesterol – HDL ratio. A baseline evaluation was done and then the angina patients and risk factors subjects were randomly assigned as control (n = 41) and intervention (yoga) group (n = 52). Lifestyle advice was given to both the groups. An integrated course of yoga training was given for four days followed by practice at home. Serial evaluation of both the groups was done at four, 10 and 14 weeks. Dyslipidemia was a constant feature in all cases. An inconsistent pattern of change was observed in the control group of angina (n = 18) and risk factor

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[75] AS Mahajan, KS Reddy and U.Sachdeva, "Lipid profile of coronary risk subjects following yogic lifestyle intervention", ***Indian Heart Journal***, 1999, Jan-Feb: 51(1): 37-40.

subjects (n = 23). The subjects practicing yoga showed a regular decrease in all lipid parameters except IIDL. The effect started from four weeks and lasted for 14 weeks. Thus, the effect of yogic lifestyle on some of the modifiable risk factors could probably explain the preventive and therapeutic beneficial effect observed in coronary artery disease.

Schmidt[76] (1997) evaluated participants of a comprehensive residential three month yoga and mediation training programme living on a low fat lacto-vegetarian diet changes in cardiovascular risk factors and hormones were studied Substantial risk factor reduction was found. Body mass index, total serum and LDL cholesterol, fibrinogen, and blood pressure were significantly reduced especially in those with elevated levels. Urinary excretion of adrenaline, noradrenaline, dopamine, aldosterone, as well as serum testosterone and luteinizing hormone levels were reduced, while cortisol excretion increased significantly.

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[76] T.Schmidt, *et al.*, "Changes in cardiovascular risk factors and hormones during a comprehensive residential three month Kriya yoga training and Vegetarian nutrition". ***Acta Physio Scand Supp,*** 1997. 640: 158-62.

Van Monttrans *et al*[77] (1990) determined the long term effects of relaxation therapy on 24 hour ambulatory intra-arterial blood pressure in patients with mild untreated and uncomplicated hypertension. DESIGN – Four week screening period followed by randomization to receive either relaxation therapy or non-specific counseling for one year. Ambulatory intra-arterial blood pressure was measured before and after treatment. SETTING – Outpatient clinic in Amsterdam's university hospital. SUBJECTS-35 Subjects aged 20-60 who were being treated by general practitioners for hypertension but were referred to take part in the study. At three consecutive screening visits all subjects had a diastolic blood pressure without treatment of 95-110 mm Hg. Subjects were excluded if they had damaged target organs, secondary hypertension, diabetes mellitus, a cholesterol concentration greater than 8 mmol/l, or a history of malignant hypertension. INTERVENTIONS - The group allocated to relaxation therapy was trained for eight weeks (one hour a week) in muscle relaxation, yoga exercises, and stress management and continued exercising twice daily for one year with monthly visits to the clinic. The control group had the same attendance schedule but had no training and were requested just to sit and relax twice a day. All

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[77] GA.Van Montirans, *et al.*, "Relaxation therapy and continuous ambulatory blood pressure in mild hypertension". ***A Controlled Study. BMJ,*** 1990, May 26; 300 (6736) : 1368-72.

subjects were asked not to change their diet or physical activity. MAIN OUTCOME MEASURE - Changes in ambulatory intra-arterial blood pressure after one year of relaxation therapy or non-specific counseling. RESULTS – Mean urinary sodium excretion, serum concentration of cholesterol, and body weight did not change in either group. Diastolic pressures measured by sphygmomanometry were 2 and 3 mm Hg lower in subjects in the relaxation group and control group respectively at the one year follow up compared with initial readings. The mean diastolic ambulatory intra-arterial pressure during the daytime had not changed after one year in either group, but small treatment effects could not be excluded; the mean change for the relaxation group was –1 mm Hg (95% confidence interval –6 to 3.9 mm Hg) and for the control group - 0.04 mm Hg (-5.3 to 4.6 mm Hg). Mean ambulatory pressure in the evening also had not changed over the year and in both groups night time pressure was 5 mm IIg higher. The variability in blood pressure was the same at both measurements. CONCLUSIONS: Relaxation therapy was an ineffective method of lowering 24 hour blood pressure, being no more beneficial than non-specific advice, support, and reassurance-themselves ineffective as a treatment for hypertension.

Pansarc Kulkarni and Pendsc[78] (1989) determined the effect of yogic training on serum LDL levels. LDH is a glycolytic enzyme utilized during exercise to provide energy to contracting muscles. Chronic submaximal exercise for a longer duration shows about two-fold increase in LDH levels. Yogic practices might be bringing similar effects. The present work was designed to study effect of yogic training on LDH levels. Fourteen female and six male students of average age or 18 years were subjected to yogic training for six weeks. Serum LDH levels were found before and after the training course by spectrophotometer method of Henry *et al.* The serum LDH levels were within normal limits and showed significant increase both in females and males after yogic training. It indicates that Yoga has similar effect on LDL levels like endurance training.

Bowman *et al*[79] (1997) in their study assessed that the effects of aerobic exercise training and yoga, a non-aerobic control intervention, on the baroreflex of elderly persons was determined. Baroreflex sensitivity was quantified by the alpha-index, at high frequency (HF; 0.15-0.35 HZ, reflecting parasympathetic activity) and mid-frequency (MF:0.05-0.15 Iiz,

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[78] M.S.Pansaarc, AN. Kulkarni and UB. Pendsc, "Effect of yogic training on serum LDH levels", ***Journal Sports Med. Phys. Fitness***, 1989, Jun; 29(2): 177-8.

[79] A.J.Bowman, *et al.*, "Effects of aerobic exercise training and yoga on the baroreflex in healthy elderly persons". **Eur. J.Clin. Invest**, 1997, May; 27(5): 443-9.

reflecting sympathetic activity as well), derived from spectral andcross-spectral analysis of spontaneous fluctuations in heart rate and blood pressure. Twenty six (10women) sedentary, healthy, normotensive elderly (mean 68 years, range 62-81 years) subjects were studied. Fourteen (4 women) of the sedentary elderly subjects completed 6 weeks of aerobic training, while the other 12 (6 women) subjects completed 6 weeks of yoga. Heart rate decreased following yoga (69 ± 8 vs. 61 +/- 7 min-1, P < 0.05) but not aerobic training (66 + 8vs. 63 +/- 9 min-1, P=0.29). VO2 max increased by 11% following yoga (P< 0.01) and by 24% following aerobic training (P < 0.01). No significant change in alpha MF (6.5 ± 3.5 vs 6.2 ± 3.0 ms mmHg-1, P = 0.69) or alpha IIF (8.5 ± 4.7 vs 8.9 ± 3.5 ms mmHg-1, P < 0.01) but not alpha MF (6.5 ± 3.0 vs 7.6 ± 2.8 ms mmHg-1, P - 029) increased. Short-duration aerobic training does not modify the alpha-index at alpha MF or alpha HF in healthy normotensive elderly subjects, alpha HF but not alpha MF increased following yoga, suggesting that these parameters are measuring distinct aspects of the baroreflex that are separately modifiable.

Telles *et al*[80] (1997) studied the heart rate, breathing rate, and skin resistance were recorded for 20community home girls (Home group) and for 20 age-matched girls from a regular school (School group). The

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[80] S.Telles, *et al.*, "Comparison of changes in autonomic and respiratory parameters of girls after yoga and games at a community home". ***Percept Mot. Skills***, 1997 Feb; 84(1): 251-7.

former group had a significantly higher rate of breathing and a more irregular breath pattern known to correlate with high fear and anxiety, than the school group. Skin resistance was significantly lower in the school group, which may suggest greater arousal, 28 girls of the Home group formed 14 pairs, matched for age and duration of stay in the home. Subjects of a pair were randomly assigned to either yoga or games groups. For the former emphasis was on relaxation and awareness, whereas for the latter increasing physical activity was emphasized. At the end of an hour daily for six months both groups showed a significant decrease in the resting heart rate relative to initial values (Wilcoxon paired sample rest) and the yoga group showed a significant decrease in breath rate, which appeared more regular but no significant increase in the skin resistance. These results suggest that a yoga program which includes relaxation, awareness, and graded physical activity is a useful addition to the routine of community home children.

Raju *et al*[81] (1997) examined the short-term effects of 4 weeks of intensive yoga practice on physiological responses in six healthy adult female volunteers were measured using the maximal exercise treadmill test. Yoga practice involved daily morning and evening sessions of 90 minutes each. Pre and post-yoga exercise performance was compared.

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[81] P.S.Raju, *et al.*, "Influence of intensive yoga training on physiological changes in 6 Adult women". A case report, ***J. Altern. Complement Medical***, 1997. Fall; 3(3): 291-5.

Maximal work output (Wmax) for the group increased by 21% with a significantly reduced level of oxygen consumption per unit work but without a concomitant significant change in heart rate. After intensive yoga training, at 154 Wmin (-1) (corresponding toWmax of the pre-yoga maximal exercise test) participants could exercise more comfortably, with a significantly lower heart rate ($P < 0.05$), reduced minute ventilation ($P < 0.05$), reduced oxygen consumption per unit work ($P < 0.05$), and a significantly lower respiratory quotient ($P < 0.05$). The implications for the effect of intensive yoga on cardio-respiratory efficiency are discussed, with the suggestion that yoga has some transparently difference quantifiable physiological effects to other exercises.

Scholl and Allolio and Schonooke[82] (1994) examined the physiological and psychological effects of Hatha-Yoga exercise in healthy women. Hatha-Yoga has become increasingly popular in western countries as a method for coping with stress. However, little is known about the physiological and psychological effects of yoga practice. We measured heart rate, blood pressure, the hormones cortisol, prolactin and growth hormone and certain psychological parameters in a yoga practicing group and a control group of young female volunteers reading in a comfortable position during the experimental period. There were no

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[82]F.J.Scholl, B.Allolio and OW.Schondoke, "Physiological and psychological effects of Hatha-Yoga exercise in healthy women", ***International Journal of Psychosom,*** 1994; 41(1-4): 46-52.

substantial differences between the groups concerning endocrine parameters and blood pressure. The course of heart rate was significantly different; the yoga group had a decrease during the yoga practice. Significant differences between both groups were found in psychological parameters. In the personality inventory the yoga group showed markedly higher scores in life satisfaction and lower scores in excitability, aggressiveness, openness, emotionally and somatic complaints. Significant differences could also be observed concerning coping with stress and the mood at the end of the experiment. The yoga group had significant higher scores in high spirits and extraverted ness.

Bhargava, Gogate and Mascarenhas[83] (1988) examined the effect of autonomic responses to breath holding and its variations following pranayama. Autonomic responses to breath holding were studied in twenty healthy young men. Breath was held at different phases of respiration and parameters recorded were Breath holding time, heart rate systolic and diastolic blood pressure and galvanic skin resistance (GSR). After taking initial recordings all the subjects practiced Nadi-Shodhana Pranayama for a period of 4 weeks. At the end of 4 weeks same parameters were again recorded and the results compared. Baseline heart rate and blood pressure (systolic and diastolic) showed a

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[83] R.Bhargava, MG Gogate and JF.Mascarenhas, "Autonomic responses to breath holding and its variations following pranayama" ***Indian J. Physiol. Pharmacol***, 1988, Oct-Dec; 32(4): 257-64.

tendency to decrease and both these autonomic parameters were significantly decreased at breaking point after pranayamic breathing. Although the GSR was recorded in all subjects the observations made were not conclusive. Thus pranayama breathing exercises appear to alter autonomic responses to breath holding probably by increasing vagal tone and decreasing sympathetic discharges.

Sundar *et al*[84] (1984) in their study assessed twenty five patients of essential hypertension were studied. Of these, 20 patients were not given any antihypertensive drug treatment (Group A); other 5 had to be put on antihypertensive drugs before including them in the study (Group B). These patients were demonstrated "Shavasana" and trained to perform it correctly. Shavasana therapy was continued for six months. There was a statistically significant fall in both mean systolic and diastolic pressure of both groups. Further, there was a significant reduction in doses of antihypertensive drugs, being given to patients of group B. In 65 % patients of group A, blood pressure could be controlled with Shavasana only and no drug was needed in them at all. Blood pressure rose significantly to pre-Shavasana levels in patients who left practicing yoga. Thus, with the use of yoga (Shavasana) in therapy of hypertension, requirement of antihypertensive drugs may be significantly

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[91] M.S.Pansaarc, AN. Kulkarni and UB. Pendsc, "Effect of yogic training on serum LDH levels", ***Journal Sports Med. Phys. Fitness***, 1989, Jun; 29(2): 177-8.

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M.S. Balasubramanian and B. Pansare conducted a study on "Effect of Yoga on Aerobic and Anaerobic Power of Muscles". Aerobic power (VO_2 max) and anaerobic power were estimated in medical students before and after six weeks of yogic training. A significant increase in aerobic power and a significant decrease in anaerobic power was observed. This may be due to conversion of some of the Fast Twitch (F.T) muscle fibres into slow Twitch fibres (S.T) during yogic training.[92]

D.D. Madanmohan[93] , et.al conducted a study on the effect of yoga training on visual and auditory reaction times (RTs), maximum expiratory pressure (MEP), maximum inspiratory pressure (MIP), 40

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[92] M.S. Balasubramanian and B. Pansare, "Effect of Yoga on Aerobic and Anaerobic Power of Muscles". Indian Journal of Physiology and Parmacology, 35:4 (1991), 281-282.

[93] D.D. Madanmohan, et.al., "Effect of Yoga training on Reaction time, Respiratory Endurance and Muscle Strength", Indian Journal Physiology and Pharmacology, 36:4 (1992), 229-233.

mg Hg test, breath holding time after expiration (BHT exp), breath holding time after inspiration (BHT insp), and hand grip strength (HGS). Twenty seven student volunteers were given yoga training for 12 weeks. Our results show that yoga practice for 12 weeks results in significant reduction in visual and auditory RTS and significant increase in respiratory pressures, breath holding times and HGS.

S.K. Ganguly and M.L. Gharote[94] conducted a study to determine the effect of yogic training on endurance and flexibility. The study was conducted on 70 students of the Regional Police Training School (RPTS), Khandala, from which 35 students were assigned to each of the experimental and control groups. Significant lowering of the sitting pulse rate was observed in the experimental group as compared to the control group. The cardiovascular endurance as judged by the Harvard Step Test improved significantly in the experimental group. Although mean increases in the Toe Touch flexibility was observed in the experimental group, it did not reach the expected statistical significance.

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[94]S.K. Ganguly and M.L. Gharote, "Effect of Yogic training on Endurance and Flexibility Level", Yoga Mimamsa, 27:3&4 (1988-89), 29-39.

V.K. Kanade and M.L. Garote[95] conducted a study on yogic training for the promotion of physical fitness and selected athletic events.

The purpose of this study was to investigate whether additional training in selected yogic exercises will be of benefit in the improvement of physical fitness and in the performance of high jump and 1500 M run, 60 students from B.P. Ed. College, Bombay were randomly selected and divided into three groups for experiment. Gr. A received training in selected asanas, Gr. B was given training in asanas plus some breathing exercises and Gr.C was treated as control. The result of 6 weeks training period revealed an improved physical fitness with reference to high jump and 1500 M run.

M.L. Garote[96] conducted a study to determine the "Effect of everyday and alternate day yoga training on the Physical Fitness of School Children". In his study were school boys with means age of 17 years when tested with the Fleishman battery of basic physical fitness tests showed significant improvement with six weeks yoga training

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[95] V.K. Kanade and M.L. Gharote, "Yogic Training for the Promotion of Physical Fitness and Selected Athletic Events", Yoga Mimamsa, 27:1&2 (1988), 24-25.

[96]M.L. Gharote, "Effect of everyday and alternate day yoga training on the Physical Fitness of School Children", Ayurveda and Yoga, 27 (July 1987), 9-15.

given for 6 days a week as well as for 3 days a week in comparison to the control group.

V. Lurtha[97] conducted a study on 36 adolescent males, who were divided into three equal groups of twelve each. Exercise programme of positive Breath Holding and negative breath holding were assigned at random of two of the three groups and the third serving as control. Positive breathing holding group practiced kumbhaka i.e. holding breath after deep slow and full inspiration and negative breath holding group practiced kumbhaka after slow expiration. Aerobic capacity was measured by the explosive work done by the subjects in leaping six stairs in two steps covering vertical height of 0.87 meter as propounded by Margaria Kalamon power test. The study proved that practice of pranayama with positive breath holding increases aerobic capacity and practice of pranayama with negative breath holding increases anaerobic capacity.

Beras[98] training schedule (BTS), a proposed tool for improvement in performance of some selected events in track and field

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[97] V.Lurtha, "Effect of Breath Holding on Aerobic and Anaerobic Capacities", Yoga Mimamsa, 24:3 (October 1985), P.29.

[98] T.K. Bera, "Development of Training Schedule for Improving Physical Performance in Athletic based on the Science of Yoga Psychology and Physical Training", NIS Scientific Journal, 14:4 (1991), 23-34.

athletics (100M run, running broad jump, shotput, running high jump, 200 M run and 800 M run), was developed using the principles of yoga, psychology and physical training. The five potential dimensions incorporated in BTS on the basis of results of various research reports were relaxation, practice of mental imagery demonstration of high quality of athletic performance, practice of mental imagery demonstration of high quality of athletic performance, practice of specific athletic skills, error correction and discussion between the athlete and the coach. The face validity of BTS was established. To test the effectiveness of the BTS vis-à-vis performance in selected athletic events, a vertical teaching model (VTM) was compared with BTS in an experimental design. 120 subjects age 20 to 30 years were participated in the experiment. The experiment consisted of the two treatment groups (BTS & VTM) and one control group designed separately for men and women subject. The data were analysed after a treatment period of 6 weeks, using ANCOVA and Scheffe's post hoc technique. The result of this study revealed that Bera's training schedule (BTS) showed a better impact in improving physical performance of the selected events in track and field athletics.

T.K. Bera and M.V. Rajapukar[99] (1990) in their study forty male high school students, age 12-15 years participated for a study of yoga in relation to body composition, cardiovascular endurance and anaerobic power. The Ss were placed into two subsets viz. Yoga group and control group. Body composition, cardiovascular endurance and anaerobic power were measured using standard method. The duration of experiment was one year. The result of ANCOVA revealed that a significant improvement in ideal body weight, body density, cardiovascular endurance and anaerobic power was observed as a result of yoga training. This study could not show significant change in body fat (mid auxillary), skeletal diameters and most of the body circumferences. It was evident that some of the fat folds (triceps, subscapular, suprailiac, umbilical, thigh and calf) and body circumferences (waist, umbilical and hip) were reduced significantly.

P.S. Raju et.al.,[100] conducted a study on twenty normal healthy volunteers (6 males and 6 females) undergoing yoga training for 90 days were studied for the effect of yoga on exercise tolerance. Their ages ranged from 18 to 28 years. The volunteers were taught

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[99]T.K. Bera and M.V. Rajapurkar, "Body Composition, Cardiovascular endurance and anaerobic power of Yogic practitioner", Indian Journal of Physiology and Pharmacology, 37:3 (1993), 225-228.

[100] P.S. Raju, et.al., "Effect of Yoga exercise tolerance in normal Healthy Volunteers", Indian Journal of Physiology and Pharmacology, 30:2 (1986), 121-132.

only pranayama for the first 20 days (Phase I) and after 90 days of yoga training (Phase II) pyruvate and lactate in venous blood and blood gases in capillary blood were estimated immediately before and after the exercise. Minute ventilation and oxygen consumption were estimated before and during the test. Post exercise blood lactate was elevated significantly during initial and Phase I; but not in Phase II, there was significant reduction of minute ventilation and oxygen consumption only in males in phase I and II at the time when the volunteers reached their 80% of the predicted heart rate. Female volunteers were able to go to high loads of exercise in phase I and II.

Jackie[101] *(1985) reported on the circulatory-respiratory effect of* aerobic dancing as evaluated by Cooper's twelve minute run/walk test for one hundred and fifty girls and women ages thirteen to fifty one years. A portion of the group served as a control while the reminder participate in the twelve weeks of aerobic dancing . On the initial twelve minute test, sixty one per cent were in Cooper's very poor or poor fitness categories. After participating in the aerobic dance sessions, only twenty seven persons were in these categories, twenty five per cent were in the good and three per cent were in the excellent categories. The control subjects showed little change.

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[101] Jackie Johnson (1985) "Aerobic Dancing What it all About? Fitness for Living", Englewood, London, Salmadar Books Ltd., 40.

Ghundiyal Santosh[102] (1988) in his study compared the effect of Aerobic and Anaerobic exercises on the physical fitness of the leper School students of Tapowan. A total of 60 students were selected from the 9th and 10th grade of Tapowan School, Amravati (age ranged from 13 to 19 years. The AAHPER youth fitness tests were administered and further were divided in three homogenous groups. Six week training programme of aerobic and anaerobic exercised were given to Group 'A' and 'B' respectively and final data was collected by the AAHPER test administration. Significance of mean differences among the groups were computed by 'F' ratio test. It was concluded that a significant improvement was found in the physical fitness of a leper student because of aerobic and anaerobic exercises.

Anshel[103] (1985) has expounded on how aerobic dance can provide rewards to athletes in particular. The advantages can be divided into psychological and physiological categories. Psychological advantages include the athlete's ability to (1) move in synchronization to music, enhancing, co-ordination and the ability to move in a series of synchronized movements (2) Focus attention on external stimuli, (3)

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[102] Ghundiyal, Santosh K. "Comparative study of the effect of Aerobic and Anaerobic exercises on physical-fitness of Leper School students of Tapowan". Unpublished Master thesis, (1988).

[103] Anshel Mark (1985), "Aerobic Dance for Athletics", Athletic Journal 65.9, 16-18, 43.

Provide a release from the anxiety accompanied with sports, daily training and pressure to succeed, (4) provide an enjoyable, yet challenging, supplement in one's quest for fitness, (5) Enhance kinaesthetic awareness, and (6) Enhance group / team cohesiveness. Physiological advantages include the following, all of which allow for injury prevention: (1) providing a total work out, supplementing the specific nature of the particular sport, (2) strengthening abdominal muscles, (3) improvement of running mechanics, and (4) improved flexibility.

Pelin Alten[104] conducted a study to examine the effects of a 3-month aerobics and weight-lifting added aerobics on body composition, serum lipids, lipoproteins and cardio and cardio vascular fitness in middle-aged women.

Thirty healthy sedentary women (mean age 42.83 ± 11.02) take part in the study. Before starting the exercises their blood samples, peripherical measurements and thickness of skin folds were taken. They were subjected to a one hour aerobics (n=20) and weight-lifting added aerobics (n=10) sessions 3 times a week. The intensity of the

[104]Pelin Alten, "The Effect of 3 month exercise on physical and physiological parameters in middle-aged group". University of Ondokuz, May 3, Samsun, (September 1998).

exercises was decreased gradually and their heart beats were raised up to 130-140 per minute at the end of sessions.

In the group having aerobics and weight-lifting added aerobics, there were no significant differences in their blood parameters, peripheric and skinfold thickness according to the exercise types they had taken ($p>0.05$).

According to the study, it was concluded that at 3 months aerobics and weight-lifting added aerobics have positive effects on physical fitness and cardio vascular system in middle-aged sedentary women.

C.B. Silverman[105] et al., conducted a study to determine the safety, feasibility and consequences of a program of progressive strength training and cardio vascular fitness training in women with fibromyalgia syndrome (FMS).

Fifteen women with confirmed FMS were monitored for injury and exercise compliance, and assessed for muscle strength (1-repetition maximum technique), cardio vascular endurance

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[105] C.B. Silverman et al., "The Effect of progressive strength training and aerobic exercise on muscle strength and cardio vascular fitness in women with Fibromyalgia", Arthritis Rheum , 47:22, (February 2002), P.8.

(6-minute walk test), and functional status (Fibromyalgia Impact Questionnaire (FIQ) before and after a 20 week excise intervention.

A program of progressive strength training and cardio vascular exercise can be safe, well tolerated, and effective at improving muscle strength, cardio vascular endurance and functional status in women with FMS without exacerbating symptoms. This program may also contribute to a reduction in the severity of several symptoms.

CHAPTER - III

METHODOLOGY

Chapter III

METHODOLOGY

Research methodology involves the systematic procedure by which researcher starts from the initial identification of the problem to its final conclusions. The role of the methodology is to carry on the research work in a scientific and valid manner.

This chapter provides an over view of the method used for the research study selection of subjects, selection of variables, selection of tests, reliability of the instrument, reliability of data, tester competency, orientation to the subjects, collection of data, administration of test, and experimental design and statistical technique employed are discussed here.

Selection of Subjects

To achieve the purpose of the study, sixty male students from Thanjavour District, Tamilnadu were randomly selected as subjects and they were medically fit. The age was ranged from 14-17 years. The selected subjects were divided into two groups namely, Group I consist of thirty literate students who were studying tenth, eleventh and twelfth standard and Group II consist of thirty dropouts

students who were completed sixth standard and below were selected randomly as subjects. A written consent was obtained from the subjects. However, they were free to withdraw their consent in case they felt any discomfort during the period of their participation; there were no dropouts in this study.

Group I and II were subjected to yogic training programmes over the period of twelve weeks and five sessions in a week in addition to their regular schedule.

Selection of Variables

The training of Yoga aims to improve all the functions of the body. Such kind of different categories of training concentrate of general fitness, which links in the transport of carrying oxygen from the air to the working muscle.

Yoga improves the functioning of the respiratory, circulatory, digestive and hormonal systems. Regular practice of yoga helps to keep our body fit, controls cholesterol level, reduces weight, normalizes blood pressure and improves heart performance. Yoga can be a powerful enhancement in regular training exercises.

Basic levels of physical fitness can be excellent maintained by indulging in a selected yogic routine. Yogic exercises deal with the vital organs of the body on which health depends.

Training of yoga builds stamina and increases the efficiency of muscles, heart and circulatory system, Yoga was selected as independent variables. Since Yoga exercise training causes changes in the above said variables, the following dependent variables were selected for this study as criterion variables.

Physical Variables

1. Arms strength
2. Muscular endurance
3. Agility
4. Explosive power
5. Speed
6. Endurance

Physiological Variables

1) Resting Pulse Rate
2) Systolic and Diastolic Blood Pressure

Selection of Tests

The purpose of the study was to investigate the effect of Yogic practice on physical and physiological variables among literates and dropouts (Male). The selected criterion variables for the study were assessed by the following standardized test items: arm strength, muscular endurance, agility, explosive power, speed, endurance was tested by AAHPER Youth Fitness Test. Resting heart rate was estimated by radial pulse method and Systolic and Diastolic blood pressure were measured by sphygmomanometer.

Reliability of Instruments

Instruments such as sphygmomanometer, calibrated measuring tape and stopwatch were used for the study. All the instruments were in good condition and workable. The calibrations were tested and found to be accurate enough to serve the purpose of this study.

Tester Competency and Reliability of the Data

To ensure uniformity and reliability of the testing techniques, the investigator had a number of practice sessions in the testing procedures with the guidance of experts. The test was conducted on the trial subjects by both the investigator and the experts. All the measurements were taken by the investigator with the assistance of

their colleagues. Care was taken that each test item was administered by the same person, so that reliable results could be ensured. After trials and familiar with the test the investigator tested the data on each of the variables and was correlated with the scores obtained by the expert on the same subject.

The tester reliability was established by test retest method. The intra class co-efficient of correlation was obtained from ten subjects on selected physical and physiological variables are given in Table I.

TABLE I

INTRACLASS RELIABILITY COEFFICIENTS OF SELECTED DEPENDENT VARIABLES

S.No.	Variables	Co-efficient of Correlation 'R'
1.	Arms strength	0.86*
2.	Muscular endurance	0.91*
3.	Agility	0.89*
4.	Explosive power	0.93*
5.	Speed	0.87*
6.	Endurance	0.91*
7.	Resting Pulse Rate	0.92*
8.	Systolic Blood Pressure	0.93*
9.	Diastolic Blood Pressure	0.94*

* Significant at 0.01 level. Table value of 0.01 level = 0.623

The test retest values were highly reliable above 0.01 level of significance.

Orientation to the Subjects

To make the subjects involve themselves in the training program an orientation class was arranged. The researcher has explained the purpose of the study to the subjects and their part in the study. Five sessions were spent to familiarize the subjects with the technique involved to execute the Yoga. The subjects were verbally motivated to attend the training sessions regularly. The subjects of all the groups were sufficiently motivated to perform their maximal level during testing periods.

Training Program

The training program scheduled with the duration and load was based on the results of the pilot study. The training program was carried out for a period of twelve weeks. The details of Yogic practice are given below.

Details of Yoga Training

The training program was scheduled for one session in the morning between 6.30 AM to 7.30 AM for five sessions in a week and the same was continued for 12 weeks.

15 Minutes – Warming up and Stretching

25 Minutes – Asanas

10 Minutes – Pranayama

10 Minutes – Relaxation

According to the required load asanas and pranayamas were selected from the list of asanas and pranayamas in this chapter. While practicing the asanas and pranayamas the principles were followed. Diagram of each asana was presented in appendix I. The following Asanas and Pranayamas were taken from B. K. S. Iyengar (2001).

Padmasana

Sit on the ground. Spread the legs forward and place the right foot on the left thigh and left foot on the right thigh. Some persons like to place first the left foot on the right thigh and then to put the right foot on the left thigh. Either process is right. Let the left hand rest on the left knee and the right hand on the right knee. Let the tips of the thumbs of both the hands touch the tips the index fingers. Keep the hand and the spinal column erect. Keep your

Padmasana

eyes close or open. Those who can place only one leg on the thigh should practice this asana daily with zeal. They will bee able to perform this asana easily after some practice. Stay in the final position for one or two minutes in the initial stage. Later increase the time gradually.

Parvatasana

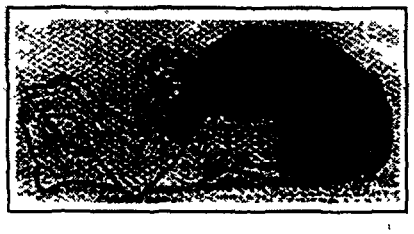
Sit in Padmasana. Join the palms of the hands. Stretch the arms vertically up over the head. Some persons perform this asana sitting in the posture of Veerasana. But the Padmasana posture is better than the Veerasana one.

Parvatasana

Pashchimottanasana

Sit on the floor with the legs stretched straight in front. Bend the trunk forward and hold the feet with the thumbs and the first and the middle fingers. Exhale, and bend the trunk lower so that the head rests on the knees. Draw the abdomen in while bending lower. This will make the bending of the trunk easy.

Pashimottanasana

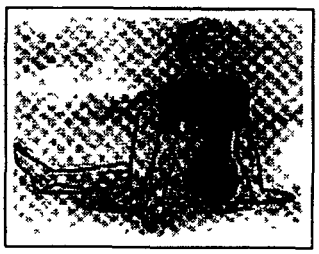


While bending bring the head between the arms. The aspirants having flexible spine can touch the knees with the head at the first attempt. Fat persons will find some difficulty in practicing this asana. Persons having a weak spine will take a fortnight or a month to accomplish perfection in this asana. Remain in this asana for five seconds. Begin with thirty seconds and gradually increase it to ten minutes.

Vakrasana

Sit on the ground with the legs stretched out. Place the left leg near the right knee, stretching out the left hand behind the back, with the palm of the hand flat resting on the ground. Then press the left knee with the right arm and put the palm on the ground. Keep the waist erect and look as far backward as possible. Practice this asana four to six times a day turning to the left side and to the right side alternatively. Gradually, increase the time. The limit is five minutes.

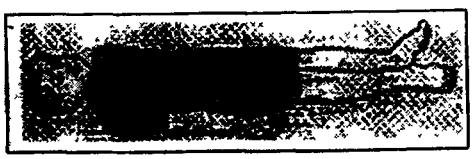
Vakrasana



Shavasna

Lie flat on the back. Place the hands a little away from the

Shavasana

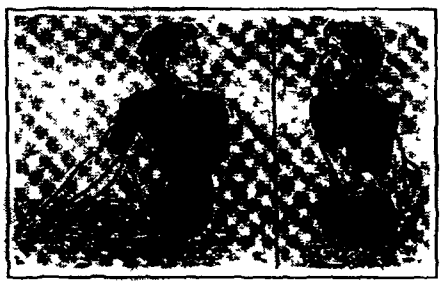


thighs with the palms up. Keep the eyes and the fists slightly closed. Stretch the legs out. Keep he heels together and the toes apart. Now close the eyes and breathe very slowly. Begin by consciously and gradually relaxing each part and each muscle of the body: feet, calves, knees, thighs, abdomen and hips. Then relax the muscle of the back, chest, arms, fingers, neck, head and face in that order. Inhale and exhale slowly and deeply. Relax the brain during exhalation. Direct your attention to the breathing, to the soul and to God. Retain the meditation for ten toe fifteen minutes. In this posture, one finds true relaxation and experiences rest, peace and plenitude. Those who suffer from excessive mental stress or heart-disease must practice only Shavasana regularly.

Ardha Matsyendrasana

Place the right heel near the anus (buttock) below the testicles. Do not move the heel from this position. Bend the left knee and put the left ankle on the outer side of the right knee. Let the right armpit rest on the outer side of the left thigh. Now push the knee backwards so that it touches the back part of the armpit.

Ardha Matsyendrasana



Then hold the toe of the left foot with the right hand. Twist the spin slowly exerting force on the joint of the left shoulder. Let the spine be twisted to the left side as far as possible. Turn the head to the left side as far as it can go. Bring it to the line of the left shoulder. Take the left hand backwards and try to hold the right thigh with it. Keep the spine erect. Remain in this position for five to fifteen seconds. Repeat the same in reverse by twisting the spine to the right side. This asana makes the spine twist completely.

Uttanapadasana

Lie flat on the back. Keep the heels of both the legs together. Inhale deeply and bend the right knee towards the stomach and hold it with both the hands. Raise the head above the ground and bring the chin closer to the knee so that it touches the knee-cap. Exhale and press the muscle of the right abdomen with the right thigh. Keep the stomach pressed till the breath is suspended. This asana is called 'Dakshina Pavanamuktasana'. If this asana is performed with the left leg, it is called 'Vama Pavanamuktasana'. Practice this exercise with both the legs together.

Uttanapadasana

This is called 'Purna Pavanamuktasana'. While holding the legs with both the hands, exhale and control the breathing. Then slowly begin inhaling while stretching the legs out.

Setubandhasana

Lie on the back. Bend both the knees. Raise the loins and thighs upward. Keep the back of the head, the neck and the shoulders firmly on the floor. Breathe normally. Remain in this position for six to eight seconds. Then take some rest and repeat the exercise. Practice this exercise four times a day in the beginning. Later, practice it six times a day.

Setubandhasana

Ardha Shalabhasana

Lie on the stomach with the face down on the ground. Stretch both the arms beside the body and clench the fists lightly. The hands can also be placed under the thighs. Inhale and retain the breath till the completion of the asana. Pull the body and raise either of the legs by about 30 cms off

Ardha Shalabhasana

the ground. Raise the leg as high as possible. Stretch the soles of the feet. Hold this position for five to thirty seconds. Then slowly bring the leg down on the ground. Exhale very slowly. Repeat this exercise with the other leg. This asana can be repeated six to seven times.

Purna Shalabhasana

Lie on the stomach with the forehead touching the ground. Stretch the arms beside the body. Keep the thumbs and the index fingers on the ground and clench the fists. Stiffen the body and raise the legs as high as possible. Stretch the soles of the feet. Put the legs, the thighs and the lower part of the abdomen up. Hold this position for five to thirty seconds and the rest the breath. Bring the legs down slowly and then exhale smoothly.

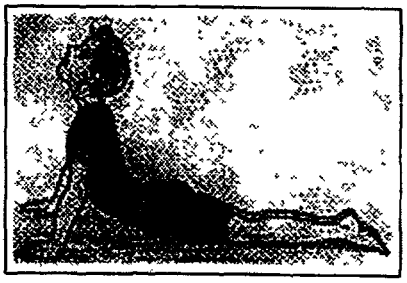
Purna Shalabhasana

Bhujangasna

Lie on the floor with the face downwards. Relax all the muscles of the body. Place the palms on the ground underneath the shoulders. Slowly raise the head and the trunk like the hood of a serpent. Bend the spine backwards. Stretch the feet backwards so that the toes

touch the ground. This will stretch well the muscles of the back and the shoulders. There will be strain on the abdomen. Hold the breath and hold this position for six to eight seconds. Then exhale and bring the head to its original position. When you first lie on the ground, keeps the chin touching the chest. Hold the breath till the head remains in the raised position. Then exhale slowly. Practice this asana five to six times.

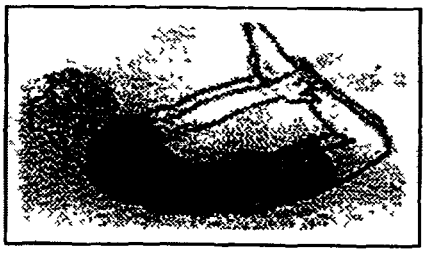
Bhujangasana



Dhanurasana

Lie prone on the floor on the stomach face downwards. Relax the muscles; keep the arms resting along side the body. Bend the legs at the knees. Raise the arms and hold the ankles with the hands. Raise the chest and the head. Fill the lungs with air. Straighten and stiffen the hands. Stiffen the legs also. The body now assumes the posture of a convex arch. If you lift the legs up, you can raise the chest. Hold the breath. Then exhale slowly. Attempt to keep the knees together.

Dhanurasana

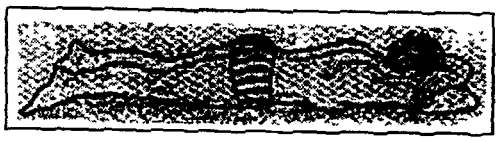


In this asana, the abdomen supports the whole body. So practice this asana when the stomach is empty. The body in Dhanurasana pose gets good exercise if it is lightly rocked from left to right and forward and backward. Stay in this position as long as possible. It can be practiced five to six times.

Makarasana

Lie on the ground face down, the chest touching the ground and both legs stretched out. Let the upper parts of the feet touch the ground. Keep the heels upwards. Raise the arms and put them in front of the head and hold the middle part of the right upper arm with the left hand. Keep the head downwards and close the eyes. The head will rest on the arms. The parts of the arms from the elbows to shoulders, the abdomen, the thighs and the upper parts of the feet will touch the ground in a straight line. Relax the body while practicing this asana. Breathe deeply and meditate on God.

Makrasana



Vajrasana

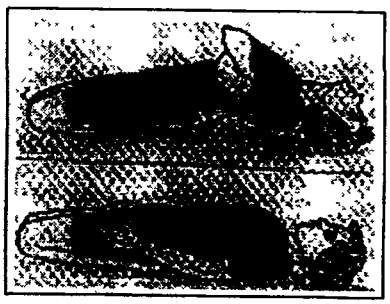
Bend the legs at the knees. Place the heels at the sides of the anus in such a way that the thighs rest on the legs and the buttocks rest on the heels. Support the whole body on the knees and ankles. Breathe normally while performing this asana. The knees and the ankles will perhaps ache in the beginning but this ache or pain will disappear by itself. Stretch the arms and place the hands on the knees. Keep the knees close by. Sit erect keeping the trunk, the neck and the head in a straight line. This is a very simple posture and one can hold this posture with ease for a longer time.

Vajrasana

Supta Vajrasana

Attain Vajrasna. Then with the support of the elbows lie with the back on the ground. The back should touch the ground. Interlace the arms and put them on the chest. Tilt the head as far back as possible. Hold this position for eight to ten seconds. In the beginning, the

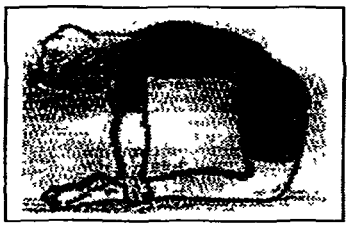
Supta Vajrasana



back may not wholly touch the ground. The lower part of the back may remain in a raised position.

Ushtrasana

Ushtrasana



Kneel on the ground as in Vajrasana keeping the distance of about fifteen cms between the knees and between the heels. Breathe deeply. Hold the right ankles firmly with the right hand and the left ankles with the left hand. Raise the arms and take them behind the neck. Breathe in the normal way. Hold this position for six to eight seconds. Repeat these asana two or three times a day.

Vrushasana

Vrukshasana

Bend the right leg at the knee and place the heel under the anus. Place the left knee on the right knee in such a way that the left heel touches the right thigh. Sit erect and place the palm of the right hand on the knee. Then place the palm of the left hand on it. Breathe in the normal way. Direct your sight and attention to the navel.

Vrukshasana

Stand on either leg. If difficulty is experienced to balance the body on one leg, take the support of a wall. Bend the other leg at the knee and place its heel at the root of the thigh of the former leg as shown in the figure. Join the palms and raise the arms straight over the head as if you are making an obeisance to the sky. Straighten the elbows. Inhale slowly. Hold this position for about ten seconds. Then repeat the pose, standing on the other leg. This exercise can be practiced four to six times a day.

Santulanasana

Santulanasana

Stand straight and erect on the ground. Keep the body straight and erect. Keep the arms on the sides. Bend either leg at the knee, keeping the knee facing downwards and the heel upwards. Hold the foot of this leg with the corresponding hand. Raise the other arm close to the ear. Hold this position for eight to ten seconds. Repeat this exercise with the other leg. In the beginning, practice this asana four times a day. Later, it can be practiced six times a day.

Utkatasana

Stand with the legs together. Raise the body on the heels and bring the arms straight over the head and join the palms. Then slowly lower the trunk. This asana does not require much strength to practice it. An aspiranet should only know how to balance the body. One who is slim but has a strong physique can practice this asana with ease and comfort.

Utkatasana

Trikonasana

Stand erect keeping a distance of about 75 cms between the feet. Stretch the arms sideways. Then raise them to the level of the shoulders. Let the palms face the ground. Stand erect. Then bend the trunk to the left side and touch the left toes with the left hand. Stretch the right arm upwards and straighten it. Keep the eyes fixed on the right arm. Bring the left hand near the left toe. Keep the left hand in the same position and rotate the right arm from over the waist and bring it to the head level. Look downward. Then touch the right toes

Trigonasana

with the right hand. This is the final position of Trikonasana. Rest for five to ten seconds and repeat this exercise with the right arm downside and the left arm upside. Hold each position for two seconds. Practice this asana four or five times a day.

Chakrasana

Lie flat on the back. Draw the legs in till the heels are close to the hips and the soles touch the ground. The gap between the legs should be of four to six inches. Bend the arms at the elbows and place them on the ground on either side of the hand.

Chakrasana

Raise the body from the waist to the hind part of the head and breathe in the normal way. Tilt the head backwards as far as possible. Keep the hands straight. Keep the body steady. Do not shift either the arms or the legs from their positions. Raise the back as far as it allows it to do. Remain in this position for about a minute. Then inhale and lower the body to the ground and bring it to the original position. Then breathe normally.

Pranayama

Nadi Shodan

Sit in any comfortable asana and check which nostril is flowing more freely than the other. Suppose the left is free, close the right nostril with your thumb and start inhaling through the left very slowly. Count 15 numbers during inhalation. Close your nostrils with your thumb and ring finger and hold your breathe inside till you have finished counting so. Open the right nostril and exhale the air slowly in 20 counts.

Surya Bhedana

Sit in the Padmasana or the siddhasana position close the eyes. Close the left nostril with the little finger of the right hand. Inhale deeply throughout the right nostril. Then close the right nostril with the right thumb. Rest the chin in the notch between the collar bone just above the breast bone. Now practice kumbhaka. Gradually, increase the time for kumbhaka. Then close the right nostril with the thumb and exhale slowly through the left nostril. Repeat this exercise in the same.

Kabalabhati

Sit in either the paddmasana or the siddhasana, place the hands on the knees. Lower the eyes. Inhale and exhale quickly and forcefully like the bellows of a blacksmith. The exercise should be done with full force so that the body perspires.

Uddiyana Bandha

This Bandha can be practiced in either standing posture or sitting posture. In the standing posture, place the hands slightly above the knees. Bend the body slightly forward keep the legs apart. Exhale with full force. Now contract the abdomen and pull it upwards and backwards to the spine with the force of the navel and the diaphragm. The diaphragm will be pulled up and the abdominal wall will be pushed up to the back.

Administration of Tests

1. Arm Strength (Pull Ups)

Purpose

To measure the strength of the arms and shoulders

Equipments

Metal or Wooden Horizontal bar approximately 1.5 inches in diameter is preferred.

Procedure

The bar should be high enough so that the pupil can hang with his arms and legs fully extended and his feet free of the floor. He should use the overhand grasp. After assuming the hanging position, the pupil raises his body by his arms until his chin can be placed over the bar and then lowers his body to a full hang as in the starting position. The exercise is repeated as many times as possible.

The body must not swing during the execution of the movement. The pull must in no way be a snap movement. If the pupil starts swinging, check this by holding your extended arms across the front of the thighs. The knees must not be raised and kicking of the leg is not permitted.

Scoring

Record the number of completed pull-ups to the nearest whole number. **(Donald K. Mathews, 1978)**

2. Muscular Endurance (Bent Knee Sit Ups)

Purpose

To measure muscular endurance of the abdominal muscles

Equipments

Mat and a stopwatch

Procedures

The examinee lies on his back with knees bent at right angles or heels about 18 inches from the hips. Hands should be clasped behind the head. A partner holds the ankles for support. On "Go", the examinee performs repeated sit-up, doing as many as possible in one minute. The elbows should alternately touch the opposite knee in the "up" position. After each up movement, the examinee is to return to the back lying position with shoulders touching the mat. The examinee should be encouraged to breathe regularly during the test.

Scoring

The score is the number of correctly performed sit-ups completed in one minute. **(Donald K. Mathews, 1978)**

3. Agility (Shuttle Run)

Purpose

To measure the agility of the performer in running and changing direction

Equipments

Marking tape, stop watch and two blocks of wood (2"x2"x 4")

Procedure

The performer start behind the starting line on the signal "go" and runs to the blocks, pick up one, return to the starting line, and places block behind the line; He then repeats the process with the second block allow some rest between the two trails. Total distance covered in one repetition was 40 yards.

Scoring

The score for each performer is the length of time require (to the nearest tenth of second) to complete the course record only the best trial. **(Donald K. Mathews, 1978).**

4. Explosive Power (Standing Broad Jump)

Purpose

The purpose of the test was to measure the explosive strength

Equipments

Measuring tape, chunnam

Procedure

The subject stood behind the take off line with his feet several inches apart before jumping. The subject dips at the knee and swinged the arms backward, then jumped forward by simultaneously extending the knees and swinged the arms forward. Three trials were given.

Scoring

The distance between the take off line and the nearest point where any part of the subject's body touched the floor. The best of three trials was recorded. **(Donald K. Mathews, 1978).**

5. Speed (50 mts Run)

Purpose

The purpose of the test was to measure the speed of an individual.

Equipments

Stopwatch, chunnam, Scorecord

Procedure

The subject took a position behind the starting line. The starter used the command, "ready" and "go". The latter was accompanied by a downward sweep of the arm as a signal to the timer. The subjects ran across the finish line. The standing start method was adopted for this purpose. The stopwatch is started on the command "Go" and stopped when the runner crosses the finish line.

Scoring

The score was the elapsed time to the nearest one tenth of a second between the starting signal and the instant the subject crossed the finished line. The fractions were rounded to the next largest one tenth of a second. One trial was permitted. **(Donald K. Mathews, 1978).**

6. Endurance (600 yard run-walk)

Purpose

To measure speed endurance

Equipments

A stopwatch, 400 m track

Procedure

Instruct the student to use a standing start. Give the signal ready, Go!, and start the stop watch on the signal Go!. The student begins running and continues running as fast as possible until he crosses the finish line. Although the examinee may walk during the test, it is not encouraged. One trial is taken.

Scoring

The time is recorded in minutes and seconds. A partner should be identified for each runner. The partner either records the time or remembers it and reports it to the scores. **(Donald K. Mathews, 1978)**

7. Resting pulse rate

Purpose

To measure the pulse rate of the subjects

Equipment

Stop watch, pencil.

Procedure

The pulse rate of all the subjects was recorded in sitting position. Before taking pulse rate the subjects were asked to sit in a chair and relax for some minute. To record the pulse rate the fingertips were placed on the radial artery at the wrist in such a manner that pulsation was clear and number of pulsation were counted for 30 seconds. Then multiplied by 2 records for 1 full minute. **(Bloomfield, 1994)**

8. Systolic and Diastolic Blood Pressure

Purpose

Find out the systolic & diastolic blood pressure.

Equipments

Sphygmomanometer and Stethoscope

Procedure

The patient was comfortably seated with the arms slightly flexed and the whole for arm supported on a smooth surface. The artery was chosen as the site of measurement and care was taken to see that clothes did not constrict the arm. A completely deflated cuff was applied snugly and evenly around the arm with the antlapited space and with the rubber bag applied over the inner aspect of the arm. The cuff was of such a type and applied in such a manners that inflation caused neither bulging nor displacement. The stethoscope was placed over the previously palpated artery in the artery in the anteribital space, not in contact with the cuff. There was no opening between the tip of the stethoscope and the skin; this was accomplished with the minimum pressure possible.

To determine the systolic pressure the cuff was rapidly inflated to a pressure about 30mm above the radial pulse level. Then the cuff was deflated at a rate of 2 (or) 3 mm of mercury per second. The level at which the first sound appeared was considered as the systolic pressure and it was noted.

To determine the diastolic pressure deflation of the cuff was continued. The point at which the sound suddenly became dull and muffled was considered as the diastolic pressure. **(Bloomfield, 1994).**

Experimental Design and Statistical Procedure

The subjects chosen for the study were divided into two experimental groups, each group consisting of 30 subjects. Experimental groups were assigned yogic practices. The data was collected for the selected physical and physiological variables first at the beginning (pre-test) and finally at the end of the experimental period of twelve weeks (post-test). The study was aimed at mainly in finding out the effects of training on selected dependent variables.

All the subjects of two groups were tested on selected dependent variables before and after the treatment. The data pertaining to the variables in this study were examined by using dependent t-test to find out significant improvement and analysis of covariance (ANCOVA) for each variable separately in order to determine the differences if any among the adjusted post test means. The level of significance was fixed at 0.05 level of confidence for all the cases.

CHAPTER - IV

ANALYSIS AND INTERPRETATIONS OF THE DATA

Chapter IV

ANALYSIS AND INTERPRETATIONS OF THE DATA

The analysis of data and detailed results of the study have been discussed in this chapter. The purpose of the study was to find out the effect of yogi practice on physical and physiological variables among literates and dropouts (male). To achieve the purpose of the study, thirty literate and thirty-dropout male from Thanjavour District, Tamilnadu were selected as subjects. The age was ranged from 14-17 years. The selected subjects were divided into two groups namely, Group I consist of thirty literate students who were studying tenth, eleventh and twelfth standard and Group II consist of thirty dropouts who were completed sixth standard and below were selected randomly as subjects. Group I and II were subjected to yogic training programmes over the period of twelve weeks and five sessions in a week in addition to their regular.

The criterion variables selected for this study were arm strength, muscular endurance, agility, explosive power, speed, endurance, systolic and diastolic pressure, and resting pulse rate. The selected criterion variables for the study were assessed by the following

standardized test items: arm strength, muscular endurance, agility, explosive power, speed, endurance was tested by AAHPER Youth Fitness Test. Systolic and Diastolic blood pressure were measured by sphygmomanometer and resting heart rate was estimated by radial pulse method. The data were collected before and after the experimental period.

The data pertaining to the variables in this study were examined by using dependent t-test to find out significant improvement and analysis of covariance (ANCOVA) for each variable separately in order to determine the differences if any among the adjusted post test means. The level of significance was fixed at 0.05 level of confidence for all the cases.

Arm Strength

The analysis of dependent 't'-test on the data obtained for arm strength of the pretest and post test means of experimental groups have been analysed and presented in Table II.

TABLE II

THE SUMMARY OF MEAN AND DEPENDENT 't' - TEST FOR THE PRE AND POST TESTS ON ARM STRENGTH OF LITERATE AND DROPOUT GROUPS

Group	Number	Mean ± SD		t-value
		Pre test	Post test	
Literates Group	30	8.56 ± 2.05	11.90 ± 1.71	11.70*
Dropouts Group	30	9.40 ± 1.77	11.36 ± 2.17	5.72*

* Significant at .05 level $t_{(.05)}(29) = 2.045$

(**Arm Strength** Scores in Numbers)

The table II shows that, the obtained t-ratio between the pre and post test means of literate and dropout group are 11.70 and 5.72 respectively. The table values required for significant difference with df 29 at .05 level is 2.045. Since, the obtained 't'- ratio value of literate and dropout group on arm strength is greater than the table value 2.045, it is concluded that the yogic training had significantly improved the arm strength of literates and dropouts.

Analysis of covariance (ANCOVA) on arm strength of literate and dropout have been analyzed and presented in Table III.

TABLE III

ANALYSIS OF VARIANCE ON ARM STRENGTH OF LITERATE AND DROPOUTS GROUPS

Adjusted Post Test Means		Source of Variance	Sum of Squares	df	Mean Squares	'F'- Ratio
Literates Group	Dropouts Group					
12.15	11.11	Between	15.59	1	15.59	6.27*
		Within	141.80	57	2.49	

*significant at 0.05 level

(The table value required for significance at .05 level with df 1 and 57 is 4.01)

Table III shows that the adjusted post test mean values on arm strength of literate and dropout groups are 12.15 and 11.11 respectively. The obtained F-ratio of 6.27 for adjusted post test means is greater than the table value of 4.01 with df 1 and 57 required for significance at .05 level of confidence. The results of the study indicate that there is significant mean difference existing between the adjusted post test means of literate and dropout groups on arm strength.

The pre and post test mean values of literates and dropouts on arm strength are graphically represented in the figure I.

The adjusted post test mean values of literates and dropouts on arm strength are graphically represented in the figure II.

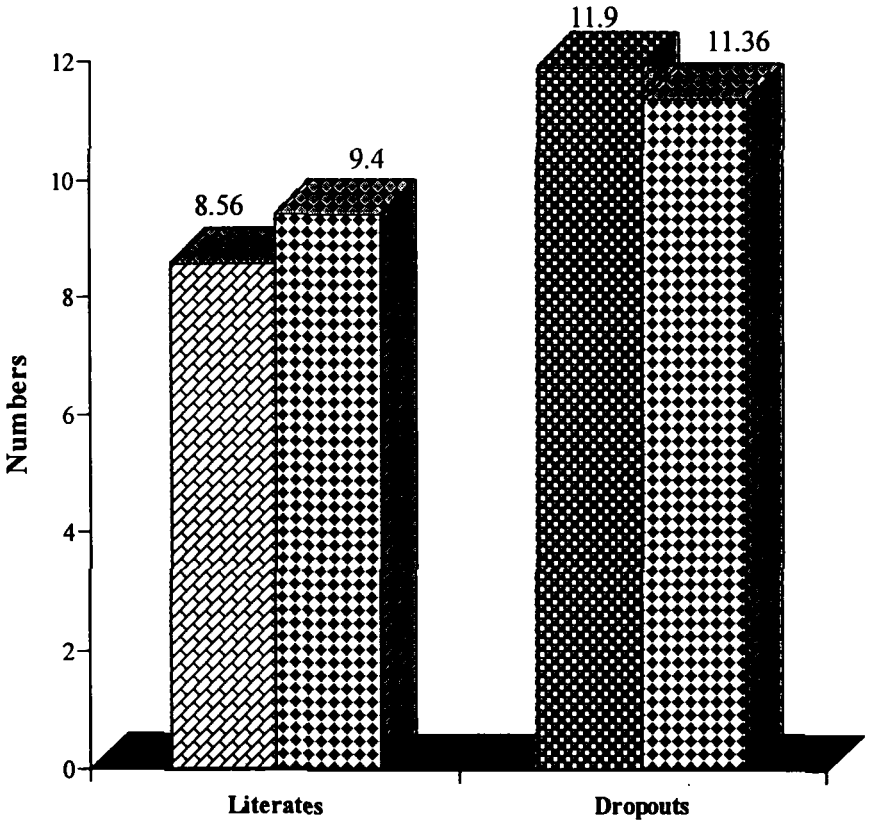


FIGURE I : MEAN VALUES OF LITERATES AND DROPOUTS ON ARM STRENGTH.

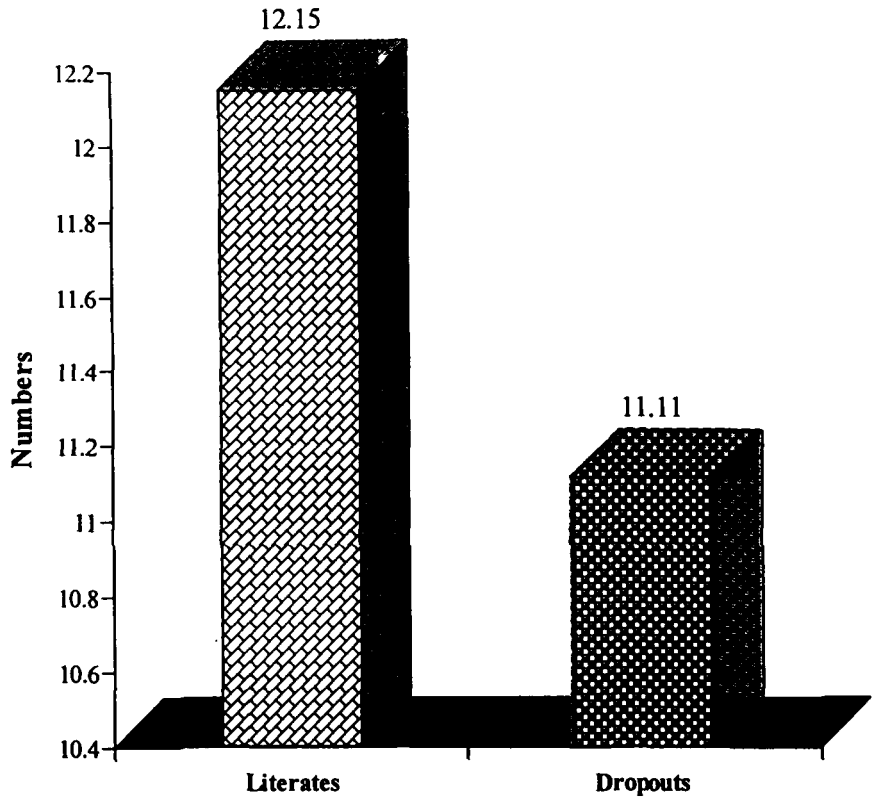


FIGURE II: ADJUSTED POST TEST MEAN VALUES OF LITERATES AND DROPOUTS ON ARM STRENGTH.

Muscular Endurance

The analysis of dependent 't'-test on the data obtained for muscular endurance of the pretest and post test means of experimental groups have been analysed and presented in Table IV.

TABLE IV

THE SUMMARY OF MEAN AND DEPENDENT 't' - TEST FOR THE PRE AND POST TESTS ON MUSCULAR ENDURANCE OF LITERATE AND DROPOUT GROUPS

Group	Number	Mean ± SD		t-value
		Pre test	Post test	
Literates Group	30	18.83 ± 2.79	22.13 ± 2.84	12.33*
Dropouts Group	30	18.27 ± 1.72	20.50 ± 1.76	10.78*

* Significant at .05 level $t_{(.05)}(29) = 2.045$

(**Muscular Endurance** Scores in Numbers)

The table IV shows that, the obtained t-ratio between the pre and post test means of literate and dropout group are 12.33 and 10.78 respectively. The table values required for significant difference with df 29 at .05 level is 2.045. Since, the obtained 't'- ratio value of literate and dropout group on muscular endurance is greater than the table value 2.045, it is concluded that the yogic training had significantly improved the muscular endurance of literates and dropouts.

Analysis of covariance (ANCOVA) on muscular endurance of literate and dropout have been analyzed and presented in Table V.

TABLE V

ANALYSIS OF VARIANCE ON MUSCULAR ENDURANCE OF LITERATE AND DROPOUTS GROUPS

Adjusted Post Test Means		Source of Variance	Sum of Squares	df	Mean Squares	'F'- Ratio
Literates Group	Dropouts Group					
21.89	20.74	Between	19.38	1	19.38	11.80*
		Within	93.64	57	1.64	

*significant at 0.05 level

(The table value required for significance at .05 level with df 1 and 57 is 4.01)

Table V shows that the adjusted post test mean values on muscular endurance of literate and dropout groups are 21.89 and 20.74 respectively. The obtained F-ratio of 11.80 for adjusted post test means is greater than the table value of 4.01 with df 1 and 57 required for significance at .05 level of confidence. The results of the study indicate that there is significant mean difference existing between the adjusted post test means of literate and dropout groups on muscular endurance.

The pre and post test mean values of literates and dropouts on muscular endurance are graphically represented in the figure III.

The adjusted post test mean values of literates and dropouts on muscular endurance are graphically represented in the figure IV.

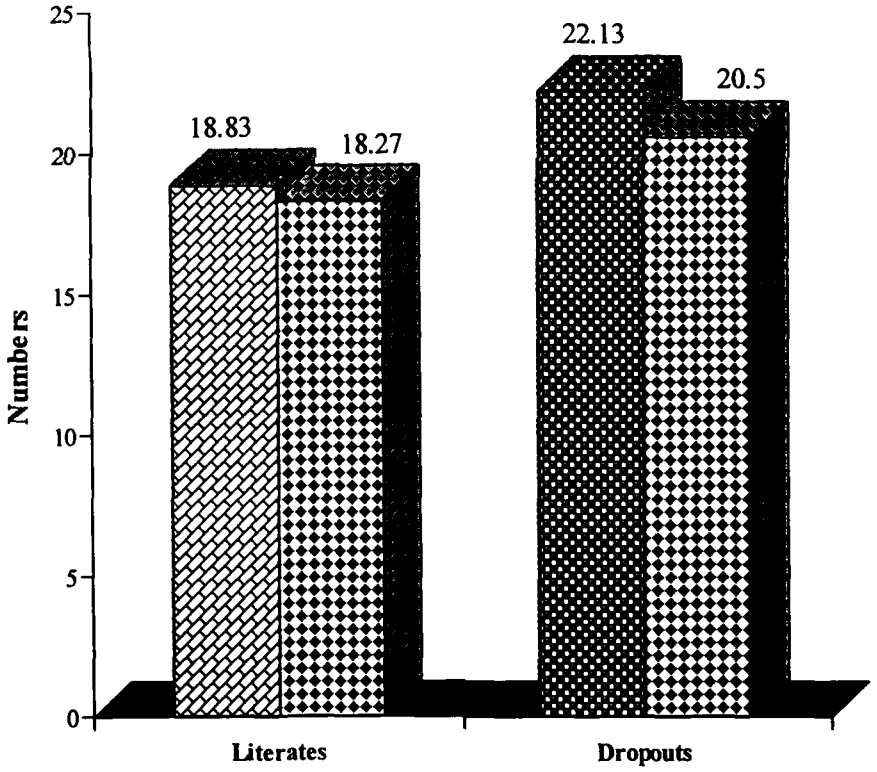


FIGURE III: MEAN VALUES OF LITERATES AND DROPOUTS ON MUSCULAR ENDURANCE.

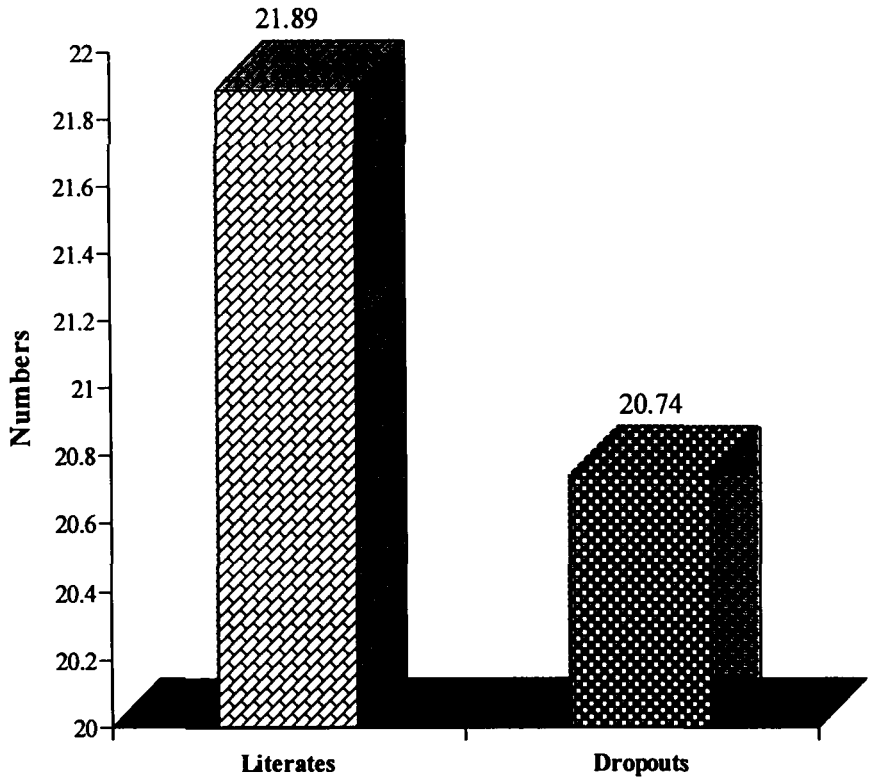


FIGURE IV: ADJUSTED POST TEST MEAN VALUES OF LITERATES AND DROPOUTS ON MUSCULAR ENDURANCE.

Agility

The analysis of dependent 't'-test on the data obtained for agility of the pretest and post test means of experimental groups have been analysed and presented in Table VI.

TABLE VI

THE SUMMARY OF MEAN AND DEPENDENT 't' - TEST FOR THE PRE AND POST TESTS ON AGILITY OF LITERATE AND DROPOUT GROUPS

Group	Number	Mean ± SD		t-value
		Pre test	Post test	
Literates Group	30	12.93 ± 0.72	12.89 ± 0.72	1.28
Dropouts Group	30	12.84 ± 0.76	12.82 ± 0.70	0.62

(**Agility** Scores in Seconds)

The table VI shows that, the obtained t-ratio between the pre and post test means of literate and dropout group are 1.28 and 0.62 respectively. The table values required for significant difference with df 29 at .05 level is 2.045. Since, the obtained 't'- ratio value of literate and dropout group on agility is lesser than the table value 2.045, it is concluded that the yogic training had not significantly improved the agility of literates and dropouts.

Analysis of covariance (ANCOVA) on agility of literate and dropout have been analyzed and presented in Table VII.

TABLE VII

ANALYSIS OF VARIANCE ON AGILITY OF LITERATE AND DROPOUTS GROUPS

Adjusted Post Test Means		Source of Variance	Sum of Squares	df	Mean Squares	'F'- Ratio
Literates Group	Dropouts Group					
12.85	12.86	Between	0.0006	1	0.006	0.02
		Within	1.76	57	0.031	

(The table value required for significance at .05 level with df 1 and 57 is 4.01).

Table VII shows that the adjusted post test mean values on agility of literate and dropout groups are 21.89 and 20.74 respectively. The obtained F-ratio of 11.80 for adjusted post test means is lesser than the table value of 4.01 with df 1 and 57 required for significance at .05 level of confidence. The results of the study indicate that there is no significant mean difference existing between the adjusted post test means of literate and dropout groups on agility.

The pre and post test mean values of literates and dropouts on agility are graphically represented in the figure V.

The adjusted post test mean values of literates and dropouts on agility are graphically represented in the figure VI.

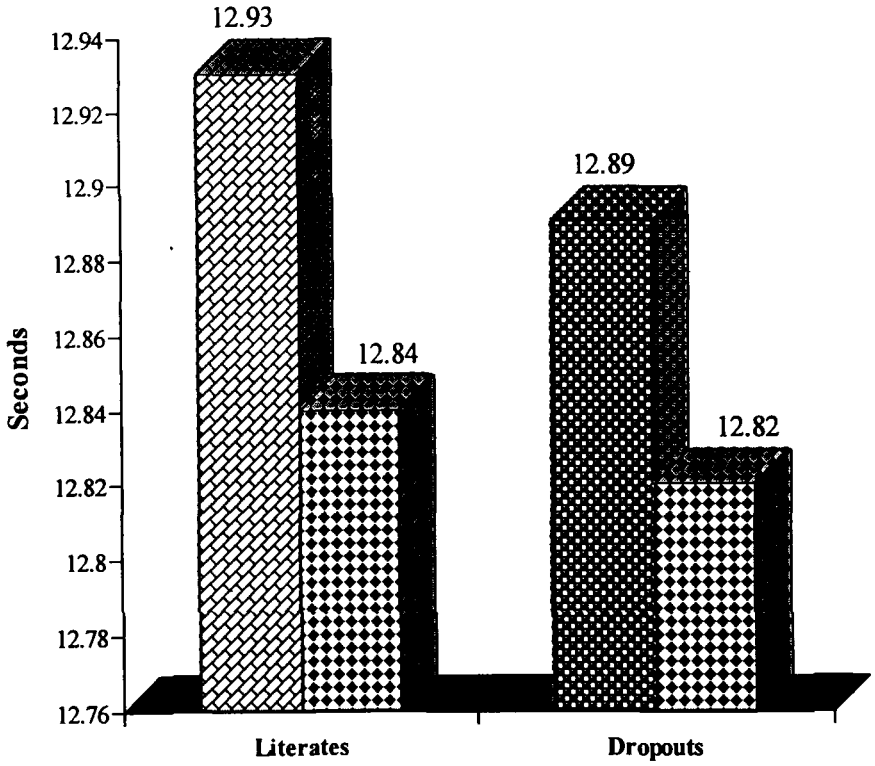


FIGURE V: MEAN VALUES OF LITERATES AND DROPOUTS ON AGILITY.

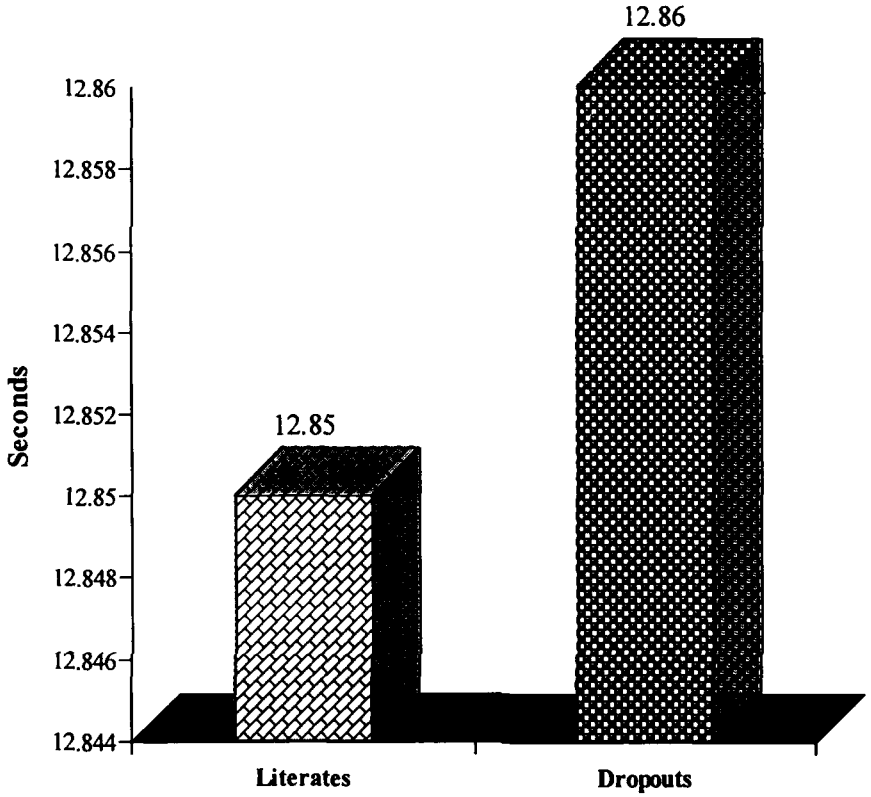


FIGURE VI: ADJUSTED POST TEST MEAN VALUES OF LITERATES AND DROPOUTS ON AGILITY.

Explosive power

The analysis of dependent 't'-test on the data obtained for explosive power of the pretest and post test means of experimental groups have been analysed and presented in Table VIII.

TABLE VIII

THE SUMMARY OF MEAN AND DEPENDENT 't' - TEST FOR THE PRE AND POST TESTS ON EXPLOSIVE POWER OF LITERATE AND DROPOUT GROUPS

Group	Number	Mean ± SD		t-value
		Pre test	Post test	
Literates Group	30	1.69 ± 0.10	1.67 ± 0.10	1.97
Dropouts Group	30	1.71 ± 0.06	1.72 ± 0.07	0.97

(**Explosive power** Scores in Metres)

The table VIII shows that, the obtained t-ratio between the pre and post test means of literate and dropout group are 1.28 and 0.62 respectively. The table values required for significant difference with df 29 at .05 level is 2.045. Since, the obtained 't'- ratio value of literate and dropout group on explosive power is lesser than the table value 2.045, it is concluded that the yogic training had not significantly improved the explosive power of literates and dropouts.

Analysis of covariance (ANCOVA) on explosive power of literate and dropout have been analyzed and presented in Table IX.

TABLE IX

ANALYSIS OF VARIANCE ON EXPLOSIVE POWER OF LITERATE AND DROPOUTS GROUPS

Adjusted Post Test Means		Source of Variance	Sum of Squares	df	Mean Squares	'F'- Ratio
Literates Group	Dropouts Group					
1.69	1.70	Between	0.0014	1	0.0014	1.86
		Within	0.045	57	0.0008	

(The table value required for significance at .05 level with df 1 and 57 is 4.01)

Table IX shows that the adjusted post test mean values on explosive power of literate and dropout groups are 1.69 and 1.70 respectively. The obtained F-ratio of 1.86 for adjusted post test means is lesser than the table value of 4.01 with df 1 and 57 required for significance at .05 level of confidence. The results of the study indicate that there is no significant mean difference existing between the adjusted post test means of literate and dropout groups on explosive power.

The pre and post test mean values of literates and dropouts on explosive power are graphically represented in the figure VII.

The adjusted post test mean values of literates and dropouts on explosive power are graphically represented in the figure VIII.

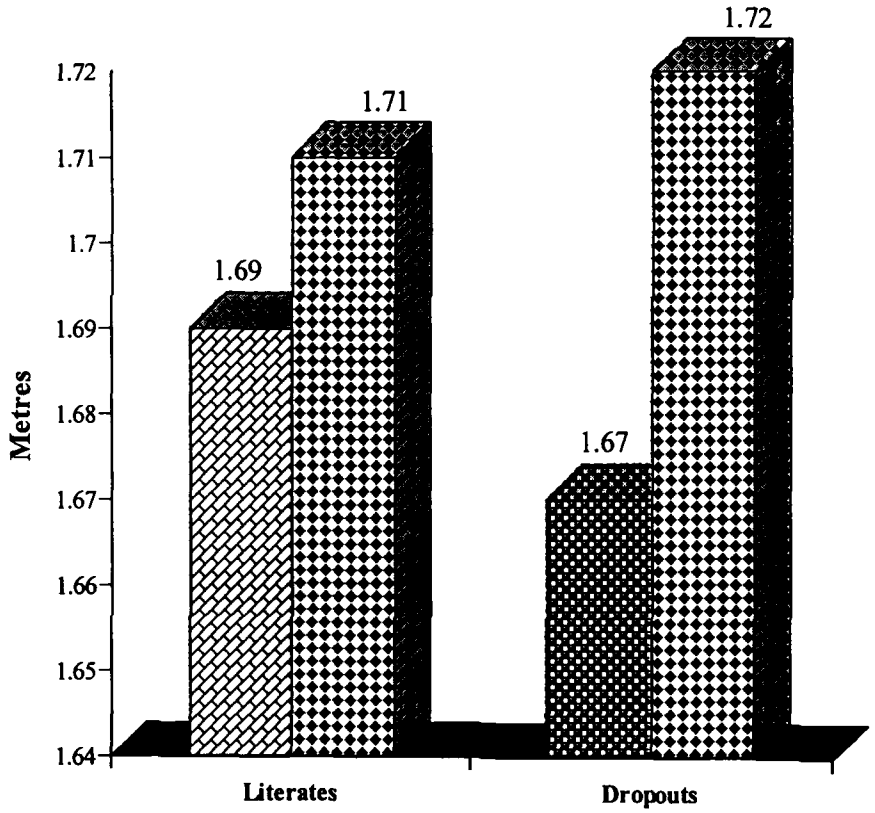


FIGURE VII: MEAN VALUES OF LITERATES AND DROPOUTS ON EXPLOSIVE POWER.

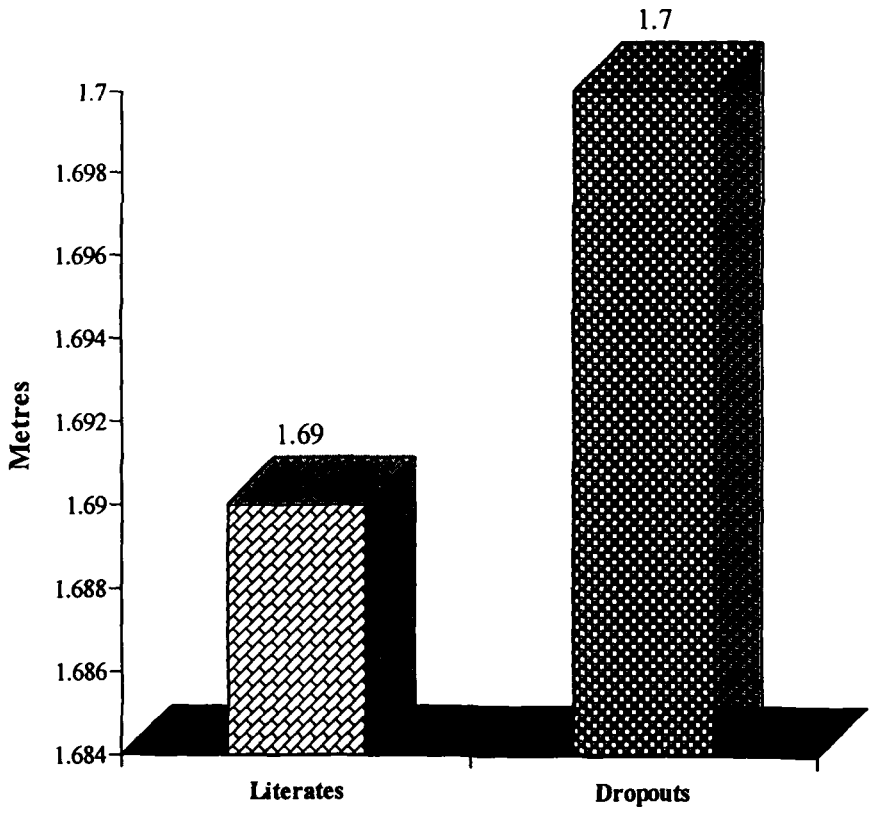


FIGURE VIII: ADJUSTED POST TEST MEAN VALUES OF LITERATES AND DROPOUTS ON EXPLOSIVE POWER.

Speed

The analysis of dependent 't'-test on the data obtained for speed of the pretest and post test means of experimental groups have been analysed and presented in Table X.

TABLE X

THE SUMMARY OF MEAN AND DEPENDENT 't' - TEST FOR THE PRE AND POST TESTS ON SPEED OF LITERATE AND DROPOUT GROUPS

Group	Number	Mean ± SD		t-value
		Pre test	Post test	
Literates Group	30	7.74 ± 0.45	7.73 ± 0.39	0.17
Dropouts Group	30	7.72 ± 0.35	7.76 ± 0.34	1.16

(**Speed** Scores in Seconds)

The table X shows that, the obtained t-ratio between the pre and post test means of literate and dropout group are 0.17 and 1.16 respectively. The table values required for significant difference with df 29 at .05 level is 2.045. Since, the obtained 't'- ratio value of literate and dropout group on speed is lesser than the table value 2.045, it is concluded that the yogic training had not significantly improved the speed of literates and dropouts.

Analysis of covariance (ANCOVA) on speed of literate and dropout have been analyzed and presented in Table XI.

TABLE XI

ANALYSIS OF VARIANCE ON SPEED OF LITERATE AND DROPOUTS GROUPS

Adjusted Post Test Means		Source of Variance	Sum of Squares	df	Mean Squares	'F'- Ratio
Literates Group	Dropouts Group					
7.73	7.77	Between	0.024	1	0.024	0.75
		Within	1.83	57	0.032	

(The table value required for significance at .05 level with df 1 and 57 is 4.01)

Table XI shows that the adjusted post test mean values on speed of literate and dropout groups are 7.73 and 7.77 respectively. The obtained F-ratio of 0.75 for adjusted post test means is lesser than the table value of 4.01 with df 1 and 57 required for significance at .05 level of confidence. The results of the study indicate that there is no significant mean difference existing between the adjusted post test means of literate and dropout groups on speed.

The pre and post test mean values of literates and dropouts on speed are graphically represented in the figure IX.

The adjusted post test mean values of literates and dropouts on speed are graphically represented in the figure X.

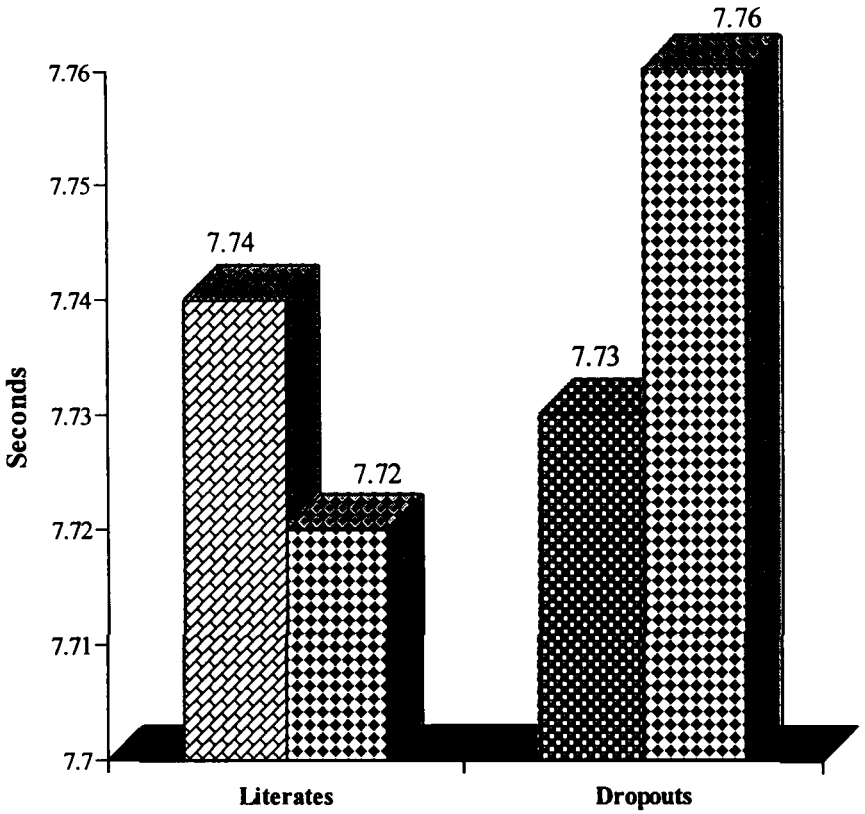


FIGURE IX: MEAN VALUES OF LITERATES AND DROPOUTS ON SPEED.

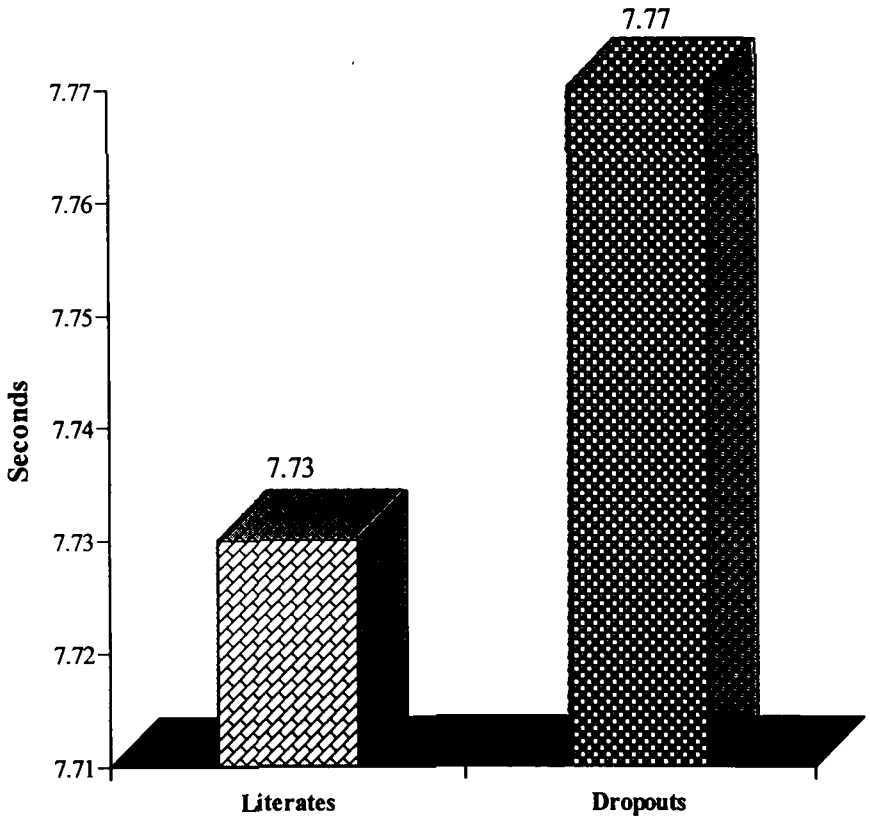


FIGURE X: ADJUSTED POST TEST MEAN VALUES OF LITERATES AND DROPOUTS ON SPEED.

Endurance

The analysis of dependent 't'-test on the data obtained for endurance of the pretest and post test means of experimental groups have been analysed and presented in Table XII.

TABLE XII

THE SUMMARY OF MEAN AND DEPENDENT 't' - TEST FOR THE PRE AND POST TESTS ON ENDURANCE OF LITERATE AND DROPOUT GROUPS

Group	Number	Mean ± SD		t-value
		Pre test	Post test	
Literates Group	30	117.10 ± 5.55	112.50 ± 6.20	10.83*
Dropouts Group	30	116.43 ± 6.45	113.34 ± 5.94	7.24*

*Significant at 0.05 level

(**Endurance** Scores in Seconds)

The table XII shows that, the obtained t-ratio between the pre and post test means of literate and dropout group are 10.83 and 7.24 respectively. The table values required for significant difference with df 29 at .05 level is 2.045. Since, the obtained 't'- ratio value of literate and dropout group on endurance is greater than the table value 2.045, it is concluded that the yogic training had significantly improved the endurance of literates and dropouts.

Analysis of covariance (ANCOVA) on endurance of literate and dropout have been analyzed and presented in Table XIII.

TABLE XIII

ANALYSIS OF VARIANCE ON ENDURANCE OF LITERATE AND DROPOUTS GROUPS

Adjusted Post Test Means		Source of Variance	Sum of Squares	Df	Mean Squares	'F'- Ratio
Literates Group	Dropouts Group					
111.73	114.07	Between	79.88	1	79.88	9.96*
		Within	457.26	57	8.02	

*Significant at 0.05 level
(The table value required for significance at .05 level with df 1 and 57 is 4.01)

Table XIII shows that the adjusted post test mean values on endurance of literate and dropout groups are 111.73 and 114.07 respectively. The obtained F-ratio of 9.96 for adjusted post test means is greater than the table value of 4.01 with df 1 and 57 required for significance at .05 level of confidence. The results of the study indicate that there is significant mean difference existing between the adjusted post test means of literate and dropout groups on endurance.

The pre and post test mean values of literates and dropouts on endurance are graphically represented in the figure XI.

The adjusted post test mean values of literates and dropouts on endurance are graphically represented in the figure XII.

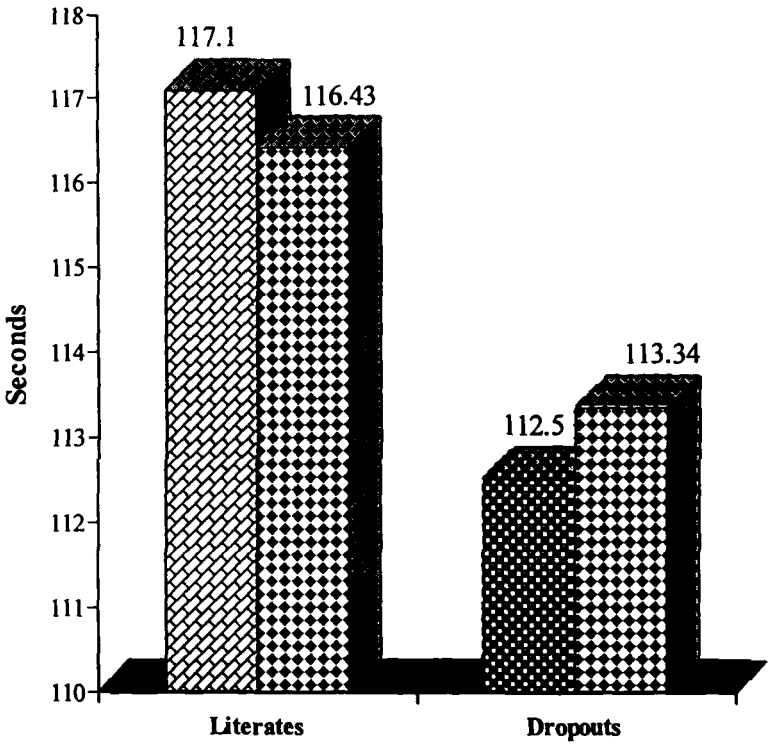


FIGURE XI: MEAN VALUES OF LITERATES AND DROPOUTS ON ENDURANCE.

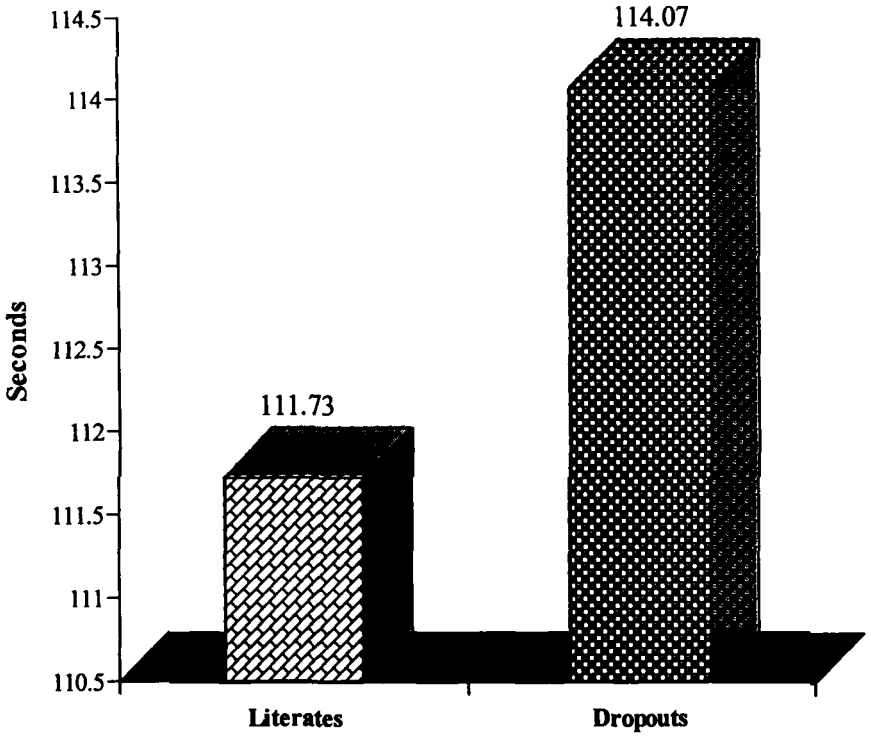


FIGURE XII: ADJUSTED POST TEST MEAN VALUES OF LITERATES AND DROPOUTS ON ENDURANCE.

Resting Pulse Rate

The analysis of dependent 't'-test on the data obtained for resting pulse rate of the pretest and post test means of experimental groups have been analysed and presented in Table XIV.

TABLE XIV

THE SUMMARY OF MEAN AND DEPENDENT 't' - TEST FOR THE PRE AND POST TESTS ON RESTING PULSE RATE OF LITERATE AND DROPOUT GROUPS

Group	Number	Mean ± SD		t-value
		Pre test	Post test	
Literates Group	30	74.17 ± 3.05	69.90 ± 2.66	12.47*
Dropouts Group	30	74.80 ± 2.68	71.57 ± 2.21	13.05*

*Significant at 0.05 level
(**Resting pulse rate** Scores in Numbers)

The table XIV shows that, the obtained t-ratio between the pre and post test means of literate and dropout group are 12.47 and 13.05 respectively. The table values required for significant difference with df 29 at .05 level is 2.045. Since, the obtained 't'- ratio value of literate and dropout group on resting pulse rate is greater than the table value 2.045, it is concluded that the yogic training had significantly improved the resting pulse rate of literates and dropouts.

Analysis of covariance (ANCOVA) on resting pulse rate of literate and dropout have been analyzed and presented in Table XV.

TABLE XV

ANALYSIS OF VARIANCE ON RESTING PULSE RATE OF LITERATE AND DROPOUTS GROUPS

Adjusted Post Test Means		Source of Variance	Sum of Squares	df	Mean Squares	'F'- Ratio
Literates Group	Dropouts Group					
70.12	71.35	Between	22.19	1	22.19	11.30*
		Within	111.90	57	1.96	

*Significant at 0.05 level
(The table value required for significance at .05 level with df 1 and 57 is 4.01)

Table XV shows that the adjusted post test mean values on resting pulse rate of literate and dropout groups are 70.12 and 71.35 respectively. The obtained F-ratio of 11.30 for adjusted post test means is greater than the table value of 4.01 with df 1 and 57 required for significance at .05 level of confidence. The results of the study indicate that there is significant mean difference existing between the adjusted post test means of literate and dropout groups on resting pulse rate.

The pre and post test mean values of literates and dropouts on resting pulse rate are graphically represented in the figure XIII.

The adjusted post test mean values of literates and dropouts on resting pulse rate are graphically represented in the figure XIV.

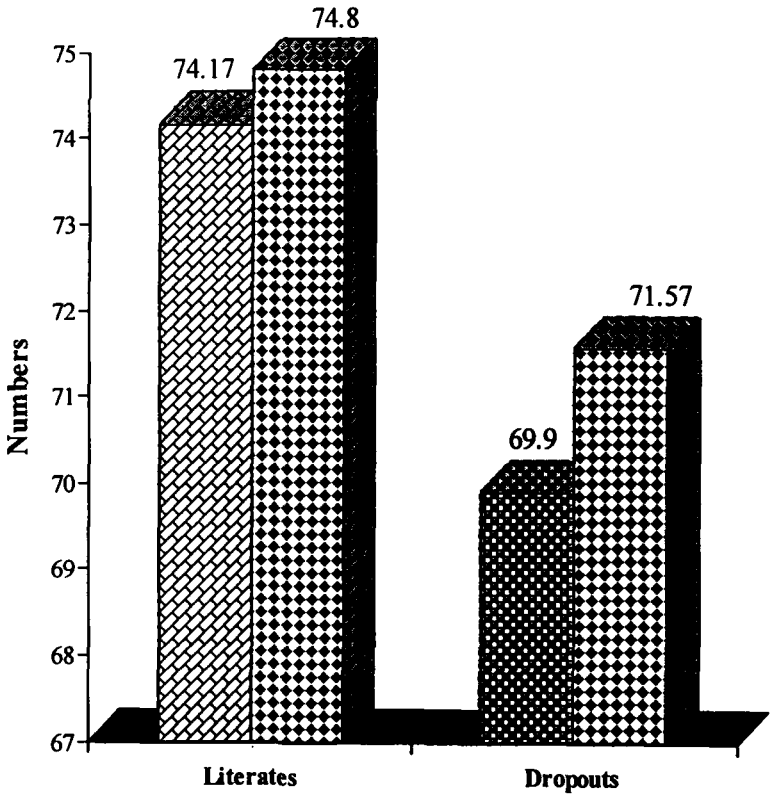


FIGURE XIII: MEAN VALUES OF LITERATES AND DROPOUTS ON RESTING PULSE RATE.

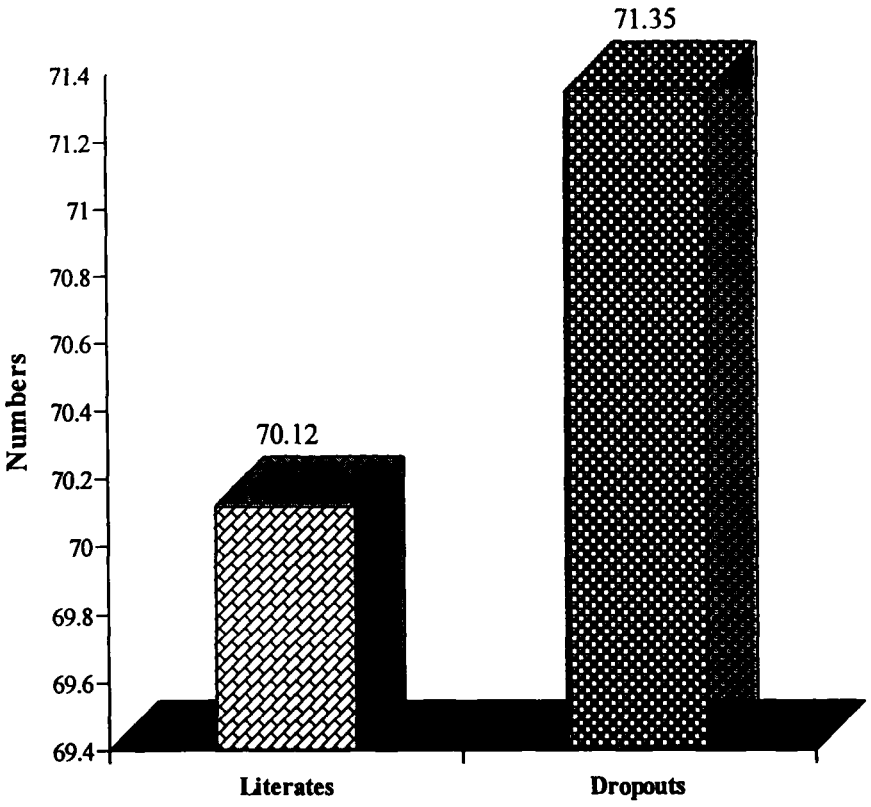


FIGURE XIV: ADJUSTED POST TEST MEAN VALUES OF LITERATES AND DROPOUTS ON RESTING PULSE RATE.

Systolic Blood Pressure

The analysis of dependent 't'-test on the data obtained for systolic blood pressure of the pretest and post test means of experimental groups have been analysed and presented in Table XVI.

TABLE XVI

THE SUMMARY OF MEAN AND DEPENDENT 't' - TEST FOR THE PRE AND POST TESTS ON SYSTOLIC BLOOD PRESSURE OF LITERATE AND DROPOUT GROUPS

Group	Number	Mean ± SD		t-value
		Pre test	Post test	
Literates Group	30	121.07 ± 5.77	111.17 ± 3.92	7.76*
Dropouts Group	30	122.30 ± 3.61	116.43 ± 3.51	18.94*

*Significant at 0.05 level

(**Systolic blood pressure** Scores in mmHg/dl)

The table XVI shows that, the obtained t-ratio between the pre and post test means of literate and dropout group are 7.76 and 18.94 respectively. The table values required for significant difference with df 29 at .05 level is 2.045. Since, the obtained 't'- ratio value of literate and dropout group on systolic blood pressure is greater than the table value 2.045, it is concluded that the yogic training had significantly improved the systolic blood pressure of literates and dropouts.

Analysis of covariance (ANCOVA) on systolic blood pressure of literate and dropout have been analyzed and presented in Table XVII.

TABLE XVII

ANALYSIS OF VARIANCE ON SYSTOLIC BLOOD PRESSURE OF LITERATE AND DROPOUTS GROUPS

Adjusted Post Test Means		Source of Variance	Sum of Squares	df	Mean Squares	'F'- Ratio
Literates Group	Dropouts Group					
111.32	116.28	Between	363.87	1	363.87	28.64*
		Within	724.10	57	12.70	

*Significant at 0.05 level
(The table value required for significance at .05 level with df 1 and 57 is 4.01)

Table XVII shows that the adjusted post test mean values on systolic blood pressure of literate and dropout groups are 111.32 and 116.28 respectively. The obtained F-ratio of 28.64 for adjusted post test means is greater than the table value of 4.01 with df 1 and 57 required for significance at .05 level of confidence. The results of the study indicate that there is significant mean difference existing between the adjusted post test means of literate and dropout groups on systolic blood pressure.

The pre and post test mean values of literates and dropouts on systolic blood pressure are graphically represented in the figure XV.

The adjusted post test mean values of literates and dropouts on systolic blood pressure are graphically represented in the figure XVI.

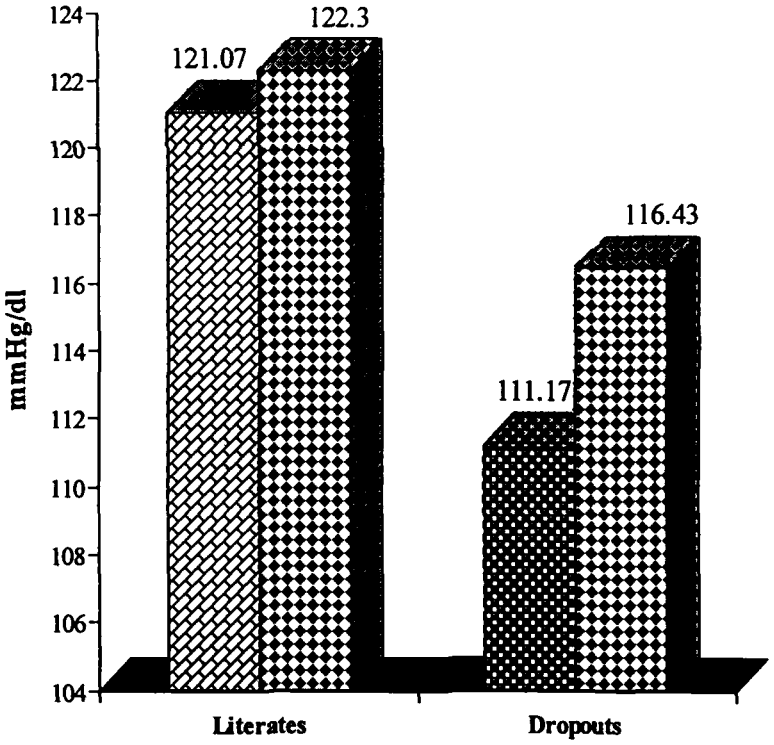


FIGURE XV: MEAN VALUES OF LITERATES AND DROPOUTS ON SYSTOLIC BLOOD PRESSURE.

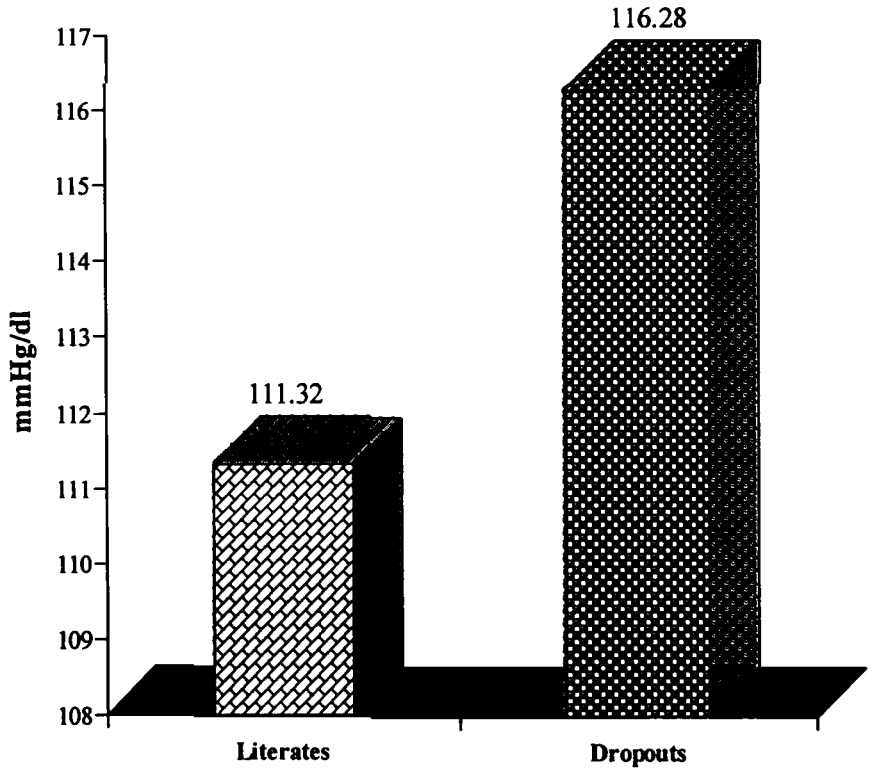


FIGURE XVI: ADJUSTED POST TEST MEAN VALUES OF LITERATES AND DROPOUTS ON SYSTOLIC BLOOD PRESSURE.

Diastolic Blood Pressure

The analysis of dependent 't'-test on the data obtained for diastolic blood pressure of the pretest and post test means of experimental groups have been analysed and presented in Table XVIII.

TABLE XVIII

THE SUMMARY OF MEAN AND DEPENDENT 't' - TEST FOR THE PRE AND POST TESTS ON DIASTOLIC BLOOD PRESSURE OF LITERATE AND DROPOUT GROUPS

Group	Number	Mean ± SD		t-value
		Pre test	Post test	
Literates Group	30	77.73 ± 3.09	73.80 ± 2.99	7.34*
Dropouts Group	30	78.07 ± 2.53	75.47 ± 3.13	8.51*

*Significant at 0.05 level
(**Diastolic blood pressure** Scores in mmHg/dl)

The table XVIII shows that, the obtained t-ratio between the pre and post test means of literate and dropout group are 7.34 and 8.51 respectively. The table values required for significant difference with df 29 at .05 level is 2.045. Since, the obtained 't'- ratio value of literate and dropout group on diastolic blood pressure is greater than the table value 2.045, it is concluded that the yogic training had significantly improved the diastolic blood pressure of literates and dropouts.

Analysis of covariance (ANCOVA) on diastolic blood pressure of literate and dropout have been analyzed and presented in Table XIX.

TABLE XIX

ANALYSIS OF VARIANCE ON DIASTOLIC BLOOD PRESSURE OF LITERATE AND DROPOUTS GROUPS

Adjusted Post Test Means		Source of Variance	Sum of Squares	df	Mean Squares	'F'- Ratio
Literates Group	Dropouts Group					
73.92	75.35	Between	30.31	1	30.31	5.82*
		Within	296.67	57	5.21	

*Significant at 0.05 level
(The table value required for significance at .05 level with df 1 and 57 is 4.01)

Table XIX shows that the adjusted post test mean values on diastolic blood pressure of literate and dropout groups are 73.92 and 75.35 respectively. The obtained F-ratio of 5.82 for adjusted post test means is greater than the table value of 4.01 with df 1 and 57 required for significance at .05 level of confidence. The results of the study indicate that there is significant mean difference existing between the adjusted post test means of literate and dropout groups on diastolic blood pressure.

The pre and post test mean values of literates and dropouts on diastolic blood pressure are graphically represented in the figure XVII.

The adjusted post test mean values of literates and dropouts on diastolic blood pressure are graphically represented in the figure XVIII.

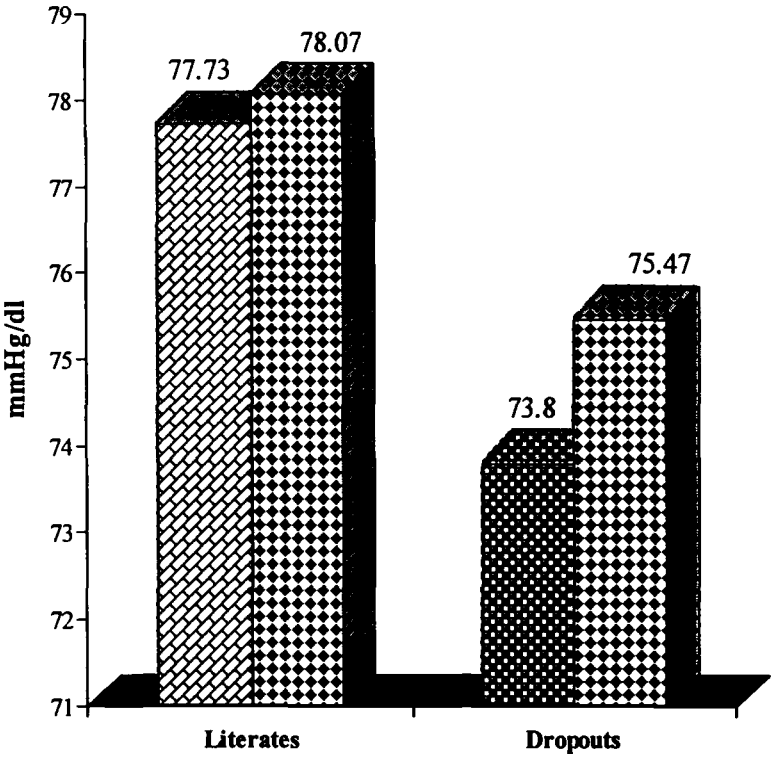


FIGURE XVII: MEAN VALUES OF LITERATES AND DROPOUTS ON DIASTOLIC BLOOD PRESSURE.

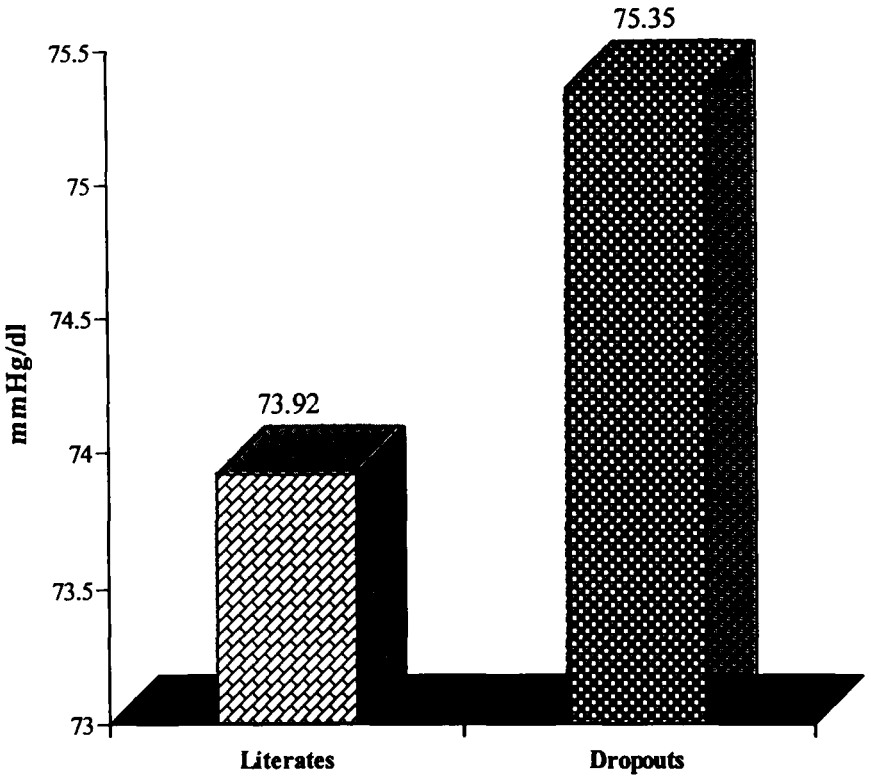


FIGURE XVIII: ADJUSTED POST TEST MEAN VALUES OF LITERATES AND DROPOUTS ON DIASTOLIC BLOOD PRESSURE.

Discussion on Findings

The result of the study indicates that all the experimental groups namely literate and dropout group had significantly improved the arm strength, muscular endurance, endurance, resting pulse rate, systolic and diastolic pressure and also there was a significant mean difference found between the experimental groups on arm strength, muscular endurance, endurance, resting pulse rate, systolic and diastolic pressure.

The results of the study also indicates the experimental groups had not improved significantly on agility, explosive power and speed and also showed there was no significant mean difference. However, the literate showed better performance in all the variables.

It is inferred from the literatures and from the results of the present study that systematically designed yogic training develops the performance standard as the selected dependent variables are very important qualities for better performance in almost all sports and games. Hence, it is concluded from the results of the study that systematically and scientifically designed yogic training may be given due recognition and be implemented properly in the training

programmes of all the disciplines in order to achieve maximum performance.

Discussion on Hypotheses

It was hypothesized at the beginning of the study that there may be a significant improvement on physical and physiological variables due to the effects of yogic practice on literates and dropouts. The findings of the study showed significant improvement except in agility, explosive power and speed. Hence, the researcher's first hypothesis was partially accepted and partially rejected.

In the second hypothesis, it was mentioned that there may be a significant difference on physical and physiological variables between the literates and dropouts. The findings of the study showed significant improvement except in agility, explosive power and speed. Hence, the researcher's second hypothesis was partially accepted and partially rejected.

CHAPTER - V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Chapter V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

Fit people make a fit nation. Fitness is that State which characterises the degree to which a person is able to function more efficiently. Fitness is an individual matter. It implies the ability of each person to live most effectively within his potentialities.

The body is the temple of Soul and to reach a harmony of the mind, body and spirit, the body must be physically fit. The human body is built for physical activity and movement. Throughout the ages, man has had to be physically active in order to procure his daily food to succeed in the battle for survival. Every individual physical activity is essential for harmonious physical and mental development.

Yoga helps to tone up the entire body to regularize blood compositions and improve blood circulations, tones up glands and visceral muscles. Regular practice of yoga helps to keep our body fit, controls cholesterol level reduces weight, normalizes blood

pressure and improves heart performance. Further, preliminary studies in the United States and India suggest that yoga may be helpful for specific conditions, such as Asthma, Epilepsy, anxiety, stress and others.

The benefits of yoga are numerous, including improved physical fitness, stress control, general well-being, mental clarity and greater self-understanding. The poses enhance muscle strength, coordination, flexibility and agility and can help a back feel better.

As for students, yoga can be a powerful enhancement in regular training exercises. Adding yoga in a routine training programme helps develop strength, flexibility, range of motion, concentration, cardiovascular health and reduces stress, tension and tightness. The most significant benefit of adding yoga to a training programme is its effect on mental performance. Yoga allows a student to train harder and at a higher level because the range of motion is greater and the fear of injury is lessened.

Nowadays yoga is becoming more and more popular. It attracts the attention of the whole world. Thousands of people both

men and women who are aware of the importance of personal growing have adopted yoga as a part of their life. Gradually, yoga is becoming a life style, almost a fashion of the modern world. People adopt yoga as a tool to keep the body and mind fit, to cure diseases by improving functions of the vital organs of the body. Yoga and yogic practices awaken the inner strength of the body. The health of our body and mind depends upon the soundness of the health of internal organs.

New researches help people to understand Yoga in its modern aspects. Yoga in general, meditation and pranayama in particular, have provided men a means to reach the subtler layers of the mind. It has been shown through experimental results on the pranayama and meditation that knowledge and creativity are structured in the subtler layer of the mind or the deeper state of consciousness (transcendental state). These creative and critical faculties of mind lay hidden in these higher state of consciousness (transcendental state).

The purpose of the present investigation is to find out the effects of yogic practice on arm strength, muscular endurance, agility,

explosive power, speed, endurance, systolic and diastolic pressure, and resting pulse rate.

To achieve this purpose, Group I consist of thirty literate students from Thanjavur District, Tamil Nadu who were studying tenth, eleventh and twelfth standard and Group II consist of thirty dropouts students from Thanjavur District, Tamil Nadu who were completed sixth standard and below were selected randomly as subjects. Their age ranged from 14 to 17 years. The experimental group I and II were subjected to yogic training programmes over the period twelve weeks and five sessions in a week in addition to their regular schedule.

Among the physical and physiological variables, the following variables were selected as criterion variables namely arm strength, muscular endurance, agility, explosive power, speed, endurance, systolic and diastolic pressure, and resting pulse rate. All the subjects were tested on selected criterion variables prior to and immediately after the training period. Arm strength, muscular endurance, agility, explosive power, speed and endurance were assessed by AAPHER youth fitness test. Systolic and diastolic pressures were measured by Sphygmomanometer and resting heart rate was estimated by radial pulse method.

All the subjects of two groups were tested on selected dependent variables before and after the treatment. The data pertaining to the variables in this study were examined by using dependent t-test to find out significant improvement and analysis of covariance (ANCOVA) for each variables separately in order to determine the differences if any among the adjusted post test means. The level of significance was fixed at 0.05 level of confidence for all the cases.

Conclusions

From the analysis of the data, the following conclusions were drawn.

1. Literate and dropout groups had achieved significant improvement on arm strength, muscular endurance, endurance, systolic and diastolic pressure and resting pulse rate.

2. Significant differences were found between literate and dropout groups towards improving the selected variables such as arm strength, muscular endurance, endurance, systolic and diastolic pressure and resting pulse rate by yogic training.

3. It may be concluded literate group is found to be better than dropout group to increase arm strength, muscular endurance,

endurance, systolic and diastolic pressure, and resting pulse rate through yogic training.

4. Literate and dropout groups had not achieved significant improvement on agility, explosive power and speed.

5. There was no significant difference found between literate and dropout groups on agility, explosive power and speed.

Recommendations

1. In the present study, it was concluded that arm strength, muscular endurance, agility, explosive power, speed, endurance, systolic and diastolic pressure, and resting pulse rate were improved by yogic training. Hence, it is recommended to the coaches, trainers and physical educators to adopt these findings to improve speed and strength parameters for their athletes.

2. A similar study may be conducted by selecting bio-chemical variables as criterion variables.

3. A similar study may be attempted by selecting the state or national level athletes or players as subjects.

4. A similar study may be conducted on female subjects.

5. A similar study may be undertaken and its influences on psychological and hematological parameters may be assessed.

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Response is as follows towards the comments made by the examiner in No.1 that why the two groups were chosen and what way they were differ on physical and physiological aspects to yogic training?

The present study was aimed at to test the yogic training whether it is so specific to literates since it underlies the degree of perceiveness on each step though it is a form of physical exercises. Basically the individual who wants to undergo the yogic training or any type of training, they have to understand its importance on human health aspects. Further the students continuing their study and discontinued their study are differed in their physical activities that are relating to day to day life. As for these above said aspects concerned, the investigator felt that the literates would have high as compared to the dropouts. Having these aspects, to test how far the literacy helps the individual during the course of yogic training on developing the physical and physiological aspects, as subjects students continue their study (literates) and students discontinued their study(dropouts) were selected for the present study.

Response is as follows towards the comments made by the examiner in No.2 that are the dropouts supposed to be illiterate and why?

In the present study the dropouts are not assumed as illiterate since they were the students who discontinued their study in certain period.

Response is as follows towards the comments made by the examiner in No.3 that two groups were said to have selected randomly which were the populations from which the two groups were sampled? What steps taken to ensure the randomness of choice?

Samples for the present study have been taken form the higher secondary school at Tiruppanandal. They were the students of aging 14 to 17, studying in 10 to 12^{th} standards (n=30) and the students of the same age group who were also the students of same school but discontinued while they were studied at 6^{th} standard (n=30). In order to ensure the effectiveness and randomness of sample

in selection of samples for two groups namely literates and dropouts, it was confined to the year in which they were enrolled in 1st standard at same school.

Response is as follows towards the comments made by the examiner in No.5 that why not the investigator described the remaining steps of yoga instead of two only that asana and pranayama?

In the present study, the yogic training was designed using the asana and pranayama which were the steps of yoga. Hence the investigator had described these two only in the introductory chapter along with the reference.

Response is as follows towards the comments made by the examiner in No.6 that the hypotheses of the study are not in clear cut fashion.

As for as hypotheses of the present study were concerned, which underlies the positive approach of the investigator on the efficacy of yogic training and literacy towards the physical and physiological systems of an individual. Hence as the examiner commented, the hypotheses were corrected and given the thesis.

Response is as follows towards the comments made by the examiner in No.8 that the participants were said to be medically fit on page 84, if so, how does one know that? And was there any evaluation of the fitness of the participants?

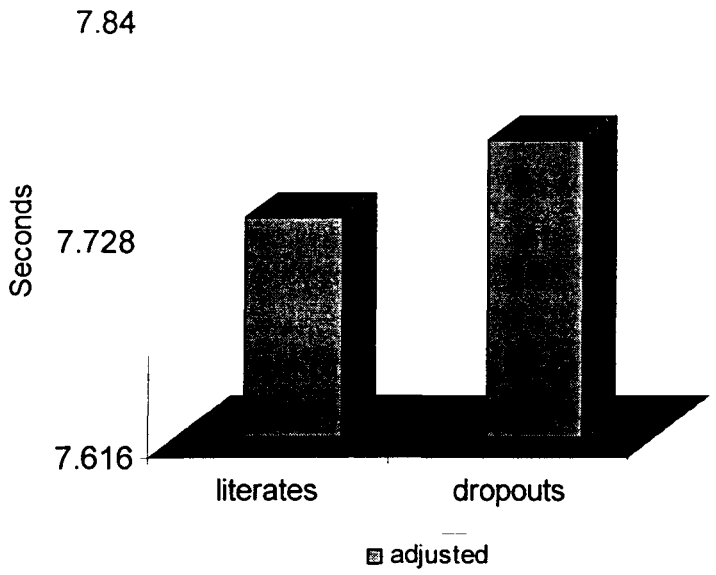
Since the present study was an experimental one, initially the samples totally 90 were selected and they were examined by a qualified physician. Of them, 60 were selected as samples for the present study that were certified as medically fit and acquaint voluntarily to serve as subjects of the present study. Thus the selected subjects (n=60) were equally divided into two groups and named as literates and dropouts.

Response towards the comments made by the examiner in No.9 that the graphs provided distort the nature of the differences between the two groups in page 136 is as follows.

The scaling set by the investigator only in constructing the graph is a source for such distorting nature of the difference between the two groups.

Dr P. MARIAYYAH, Ph.D.
PROFESSOR AND HEAD (Rtd)
DEPARTMENT OF PHYSICAL EDUCATION
BHARATHIDASAN UNIVERSITY,
TIRUCHIRAPPALLI - 620 024.

Adjusted post test means on speed of literates and dropouts



Dr P MARIAYYAH, Ph.D.
PROFESSOR AND HEAD, (Retd)
DEPARTMENT OF PHYSICAL EDUCATION
BHARATHIDASAN UNIVERSITY,
TIRUCHIRAPPALLI - 620 024