Chapter – I

INTRODUCTION

Health is the level of functional or metabolic efficiency of a living organism. In humans, it is the general condition of a person’s mind, body, usually meaning to be free from illness, injury or pain (as in “good health” or “healthy”). The World Health Organization (WHO) defined health in its broader sense in 1946 as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity”. Although this definition has been subjected to controversy, in particular as lacking of operational value and because of the problem created by the use of the word “complete”, it remains the most enduring.

The word yoga origines from the Sanskrit word "Yuj" meaning to yoke, join or unite. This implies joining or integrating all aspects of the individual - body with mind and mind with soul - to achieve a happy, balanced and useful life, and spiritually uniting the individual with the supreme. In India, Yoga is considered one of the six branches of classical philosophy that is referred throughout the Vedas - ancient Indian scriptures and amongst the oldest texts in
existence. The *Upanishads* are also broadly philosophical treatises which postdate the *Vedas* and deal with the nature of the “soul” and universe. However, the origins of yoga are believed to be much older than that, stemming from the oral traditions of Yogis, where knowledge of Yoga was handed down from *Guru* (spiritual teacher) to *Sisya* (spiritual student) all the way back to the originators of Yoga, “the *Rishis,”* who first began investigation into the nature of reality and man's inner world. Legend has it that knowledge of Yoga was first passed by Lord Shiva to his wife Parvati and from there into the lives of men.

Yoga is one of the most ancient cultural heritages of India. The word yoga in Sanskrit means “to unite”, and so yoga can be said to connote a unitive discipline. In this sense it is an exercise in moral and mental cultivation that generates good health (*arogya*), contributes to longevity (*chirayu*), and the total intrinsic discipline culminates into positive and perennial happiness and peace. Therefore, yoga is said to be indispensable of the ultimate accomplishment in life. It is a science that affects not only the conscious self but the subconscious as well. It is a practical
physiological training (kriya yoga), which if practiced can exalt man to the ‘supra mundane level’.¹

Yoga is a complete science of life that originated in India many thousands of years ago. It is the oldest system of personal development in the world, encompassing body, mind and spirit. The ancient yoga had a profound understanding of man’s essential nature and of what he needs to live in harmony with himself and his environment. They perceived the physical body as a vehicle, with the mind as the driver, the soul as man’s true identity, and action, emotion and intelligence as the three forces, which pull the body-vehicle. In order for these to be integrated, development of these three forces must be in balance. Taking into account the interrelationship between body and mind, the yogis formulated a unique method for maintaining the balance – a method that combines all the movement you need for physical health with the breathing and meditation techniques that ensure peace of mind.²

Yoga is an exact science. It is a perfect, practical system of self-culture. It is the discipline of the mind, senses and the physical

body. It helps the student to attain perfect concentration of the mind, ethical perfection, moral excellence and spiritual calmness. It is the master-key to unlock the realms of peace and bliss, mystery and miracle. Yoga does not consist in sitting cross-legged for six hours or stopping the beatings of the heart or getting oneself buried underneath the ground for a week or a month; these are mere physical feats. Real Yoga is the attainment of the highest divine knowledge through conscious communion with God. The word Yoga comes from the Sanskrit root “Yuj” which means “to join.” Yoga is the science that teaches us the method of uniting the individual soul with the supreme Soul, of merging the individual will in the Cosmic Will. Yoga transmutes the unregenerate nature of the student and raises him to the highest state of Divine glory and splendour. It bestows on you increased energy, vitality, vigour, longevity and a high standard of health. It will infuse in you a sense of security, a new strength, confidence and self-reliance. Yoga brings a message of hope to the forlorn, joy to the depressed, strength to the weak, and knowledge to the ignorant. It kills all sorts of pain, misery and tribulation. By practice of Yoga you can turn out efficient work
within a short space of time, resist temptations, remove disturbing elements from the mind and attain full success in every walks of life. Through the practice of Yoga you can control the subtle forces within the body and nature. You can unfold all your latent faculties and develop physical, mental, supernatural and divine powers. The whole mystery of Nature will become an open book to you. You can live in the eternal light and glory of God.³

While the practice of yoga started nearly 6,000 years ago, the earliest written record documenting yoga as a health practice are recorded in the Vedas texts from India dating back atleast three thousand years. There have been other ancient texts documenting the philosophy and ideology of yoga. However, yoga did not emerge as a fully developed practice until 500 B.C. In its traditional form yoga is considered a complete lifestyle that provides a path to spiritual enlightenment.

The word ‘Yug’ is comes from Sanskrit which means to unite and it also represents both a process and a state of unity. Yoga is the culmination of syntropy: it is a state devoid of the limitations of time and space, a state which transcends matter and energy and which
cannot be qualified by any attribute. This reality of pure consciousness has been recognized by all thinkers, spiritualists or materialists, as the fundamental axiom of life from which intelligence, volition, love and thought emanate.³

Yoga is usually defined as union: union between the limited self and the Divine Self. The aim of Yoga is not really to unite us with anything for we are already united. It to it helps as to realize our identity with the Divine Self, to make us know and tune into our intrinsic nature. There are many definitions of Yoga, which apply to all levels of existence and awareness. At the physical level, we need to harmonize the functions of different organs, muscles and nerves so that they do not hamper or oppose each other. Disharmony in various body parts and systems brings about inefficiency and lethargy or clumsiness. Moreover, it manifests diseases in the body.⁴

“Yoga is not an ancient myth buried in oblivion. It is the most valuable inheritance of the present. Today it’s mandatory and fortunately it going to be the culture of tomorrow”.

Yoga is an ancient system of breathing practices, physical exercises and postures, and meditation intended to integrate the practitioner's body, mind, and spirit. Thousand years ago it developed in India, and its principles were first planned down by a scholar named Patanjali in the second century B.C.

Yoga had its genesis in the wandering ascetics who sought the solitude of the forests to practice this ancient science and then imparted their knowledge to the ardent pupils (mumuksu) who lived in their ashrams. The ancient yogins were possessive about this art form and did not make any effort to popularize yoga. The yogic postures and the subsequent stages of yoga were handed down only to the deserving students. Hence, this science remained limited to the confines of the forests or remote caves. Very little was known about this Vedic practice until the Yoga Institute of Santa Cruz, Mumbai

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was founded in 1918, which became India's oldest technical institute on Yoga.\footnote{Retrieved from http://hinduism.about.com/bl-yoga-define.htm on 24-04-2012.}

Yoga is a practical aid, not a religion. Yoga is an ancient art based on a harmonizing system of development for the body, mind, and spirit. The continued practice of yoga will lead you to a sense of peace and well-being, and also a feeling of being at one with their environment. This is a simple definition. The practice of yoga makes the body strong and flexible, it also improves the functioning of the respiratory, circulatory, digestive, and hormonal systems. Yoga brings about emotional stability and clarity of mind. Think of this practice as being the means and tools to realign and rebalance your vehicle (body) on a regular basis. You take control and you can then become your body mechanic instead of having to pay someone else to do it (medical professionals). Because your body is finely tuned you will find that your chances for injuries and illnesses will drop as you are in a much more attuned state. You don't want for something major to happen to you before you decide to do something about it.
That's reactive behavior and that's going to set you back big time, all you have to do is take action now.\(^8\)

Yoga postures (known as asanas), help to stretch and relax the muscles and skeletal system of the human body. The physical release through these soothing movements can help create a sense of calmness and well-being. Physical exercise of any kind will help people with high levels of anxiety, and yoga postures have the added bonus of specifically generating deep muscle relaxation while toning at the same time.\(^9\)

Yoga is perhaps the only form of activity which massages all the internal glands and organs of the body in a thorough manner, including those – such as the prostate – that hardly get externally stimulated during our entire lifetime. Yoga acts in a wholesome manner on the various body parts. This stimulation and massage of the organs in turn benefits us by keeping away disease and providing a forewarning at the first possible instance of a likely onset of disease or disorder. By gently stretching muscles and joints as well


as massaging the various organs, yoga ensures the optimum blood supply to various parts of the body. This helps in the flushing out of toxins from every nook and cranny as well as providing nourishment up to the last point. This leads to benefits such as delayed ageing, energy and a remarkable zest for life. Muscles that have become flaccid, weak or slothy are stimulated repeatedly to shed excess flab and flaccidity.\textsuperscript{10}

Yoga is an ancient system of breathing practices, physical exercises and postures, and meditation intended to integrate the practitioner's body, mind, and spirit. It originated in India several thousand years ago, and its principles were first noted by a scholar named Patanjali in the second century B.C. The word yoga comes from a Sanskrit word, yukti, and means “union” or “yoke”. The various physical and mental disciplines of yoga were seen as a method for individuals to attain union with the divine.\textsuperscript{11}

The three Sanskrit words Pranava, Pran and Pranayama come from the same Sanskrit root ‘pran’ which represents the life force, the universal energy. These three concepts and the realities they


\textsuperscript{11} Retrieved from http://www.minddisorders.com/Py-Z/Yoga.html on 08-08-2012.
represent form a continuum in which human beings are indissolubly linked to the divine source of cosmic energy.\(^\text{12}\)

The science of breath is called in Sanskrit pranayama. The word pranayama is a compound word which consists of prana and yama. Prana means life-force, or the vital energy, or that force by which we have our life. Aama means control, i.e. control of the breath. That is the literal meaning. The first expression of life-force or prana is in the motion of the lungs. If a child does not breathe after the birth for some time, we give up the hope of that child. The first expression of life would be the breath, and motion of the lungs produces the breath. It is the primary function, and all other functions of the heart, digestive organs, and others are secondary.\(^\text{13}\)

Pranayama, or control or regulation of the life force is the fourth step in the Ashtanga yoga system of Patanjali. The control of the breath leads to the control of the life force or prana. The ancient yogis developed many breathing techniques to maximize the benefits of prana. The word “Pranayama” is made up of two words, Prana and Yama. Here Prana means the capacity to keep body alive by air


\(^{13}\) Swami Abhedananda, *Yoga Psychology*, (Calcutta: Ramakrishna Vedanta Math, 1999), p.54.
i.e breath and yama means expansion, stretching or extension and control of breath. Thus Pranayama means the art of controlling breath. Pranayama is used in yoga to clear and clean body and mind. It is also used in preparation for meditation, asanas, postures and focussing of the mind. Pranayama creates alertness, heat on both physical and subtle levels, and arouse body, mind and spirit or kundalini power. The purpose of Pranayama is to make the respiratory system function at its best. Pranayam is not so complex as it is thought to be. The ancient Sanskrit texts state that proper Pranayama can cure all diseases, but wrongly done will only invite the same diseases. Therefore we must take extreme caution before practicing and leaving it under the supervision of an experienced teacher. If you feel any kind of discomfort or symptom such as dizziness or nausea as you practice breathing, then lie down and relax in Savasana or the Child Pose for a few recovery breaths. If discomfort persists, do not continue your practice until you get advice regarding your symptoms.\footnote{Retrieved from \url{http://www.india-shopping.net/yoga/pranayam.html} on 08-08-2012.}
“Pranayama is control of Breath”. “Prana” is Breath or vital energy in the body. On subtle levels prana represents the pranic energy responsible for life or life force, and “ayama” means control. So Pranayama is “Control of Breath”. One can control the rhythms of pranic energy with pranayama and achieve healthy body and mind. Patanjali in his text of Yoga Sutras mentioned pranayama as means of attaining higher states of awareness, he mentions the holding of breath as important practice of reaching Samadhi. Hatha Yoga also talks about 8 types of pranayama which will make the body and mind healthy. Five types of prana are responsible for various pranic activities in the body, they are Prana, Apana, Vyan, Udana & Samana. Out of these Prana and Apana are most important. Prana is upward flowing and Apana is downward flowing. Practice of Pranayama achieves the balance in the activities of these pranas, which results in healthy body and mind.\textsuperscript{15}

In the Bhagavad Gita in verse 4.29, Krishna advises Arjuna how breath management can help promoting physical and mental health to lead (spiritual) self-realization. In Brihadaranyaka

Upanishad III, in the dialogue between Ygnavalkya and Asvala, you observe how simple air is elevated to the status of vital breath or udgatri and how “it is the means to liberation, to complete liberation” from all sickness, physical and mental. Hathayoga Pradipika, a 15th century tome by a great Yogi, Svatmarama, swears that yogic faultless breathing prevents sickness and is also a panacea for all disease. Unfortunately, most of us have chosen to be overpowered by it and are frequently sick. The vital importance of proper breathing or pranayama, as it is called, makes it the key among the eight vital steps in asthanga-yoga. The meaning of the Sanskrit word prana is that which journeys well, in this case through all the cells of the body. Yama is the management of the duration of the breath. So pranayama is the wise management of breathing in order to feed adequate oxygen to body cells, in particular to the neurons of the brain to pacify them and ensure healthier performance of the body parts.\(^\text{16}\)

In yoga, there are five main components of the body-mind multiplex, one of which is the pranamaya kosha or the sheath of

prana. The five koshas are: a) annamaya kosha or the digestive system, b) pranamaya kosha or the nano or cellular world living on oxygen, which is virtually the entire body, c) vignanamaya kosha or the objective and mathematical left brain that should desirably have a more crucial role to play in all decision making, d) manonmaya kosha or the emotional right brain and e) anandamaya kosha or the world of divine bliss. This Kosha is also embedded in the human body.¹⁷

Pranayama, the formal practice of controlling the breath, lies at the heart of yoga. It has a mysterious power to soothe and revitalize a tired body, a flagging spirit, or a wild mind. The ancient sages taught that prana, the vital force circulating through us, can be cultivated and channeled through a panoply of breathing exercises. In the process, the mind is calmed, rejuvenated, and uplifted. Pranayama serves as an important bridge between the outward, active practices of yoga--like asana--and the internal, surrendering practices that lead us into deeper states of meditation.¹⁸

‘Pranayama’ is the fourth stage in Pathanjali's, eight stage Yoga discipline. Two Sanskrit words are combined in the word ‘Pranayama’ - Prana and Ayama. ‘Prana’ means life or life force. ‘Ayama’ means development or control. Therefore Pranayama is the development and control of life force. It is a form of breathing exercise, very important in yoga. It goes along with the asanas or exercise. Breath is the life force that sustains life. Nobody can survive a few minutes more without air. When breath stops, life ends. The Forefathers of Yoga developed a special system- ‘Pranayama’ to increase, develop and control this life force. Normal breathing use only a fraction of our potential respiratory capacity. Pranayama helps to control this life force in a superior and extra ordinary way to reap maximum benefits. There are various types of Pranayama. Some of the popular forms are ujjayee, shitali, viloma, kapalabhati, anuloma, suryabhendana, bhastrika etc. There are variations in performing different Pranayamas. Some of them can be done in a sitting position while others in a standing line or sitting position. Some of the Pranayama are difficult and complicated to perform while others are easy. Pranayama can be mastered only
gradually. It may take months or even years before the practitioner mind becomes receptive to the regulated flow of breath and he experiences the full benefits of pranayama. Proper practice of pranayama can control almost any disease but improper practice may give rise to all sorts of respiratory ailments. So one should take care to acquire control over his breath gradually.¹⁹

Yoga breathing exercises (pranayama) meet the deficiency:

—The full yogic breath fills first the base of the lungs, where the pulmonary lobes are much bigger in size than in the upper chest.

—Kapalabhati increases the vital capacity by repeatedly emptying the lungs, thus making use of the expiratory reserve volume, which consists of up to 1200ml of air. Followed by two very deep inhalations, the inhalatory reserve volume fills to 3300ml of air. Finally, the retention uses the increased vital capacity of up to 5000ml, allowing oxygen and carbon dioxide to exchange freely between the lungs and the circulatory system.

—The practice of anuloma viloma counteracts poor breathing habits, resulting in proper breath control.\textsuperscript{20}

The Bihar School of Yoga is a modern school of yoga founded by Swami Satyananda Saraswati in 1964. The Bihar School of Yoga imparts traditional yoga teachings to householders and sannyasins alike from across the globe. In addition to provide spiritual instruction to aspirants, the school also guides yoga projects and medical research in association with various corporations, state government and public works aiming to provide methods of health-improvements.

The yoga taught at Bihar School is known as Satyananda Yoga or Bihar Yoga and is an integral system which addresses the qualities of head, heart and hands – intellect, emotion and action – and attempts to integrate the physical, psychological and spiritual dimensions of yoga into each practice. Satyananda Yoga is suitable for everyone, regardless of age, gender, nationality, religion, mental condition or level of fitness. It is a holistic system which addresses all aspects of human life in the spheres of physical health, mental

\textsuperscript{20} Swami Sivadasananda, “In Tune With Elements”, \textit{Yoga Life}, (Summer 2004), 35.
well-being, emotional behaviour and work environment. Awareness is emphasized and practitioners are encouraged to learn about all aspects of their personality through yoga. Adjustment in stages is emphasized, not a total change in one’s lifestyle and environment.\textsuperscript{21}

The techniques developed at Bihar School of Yoga are a synthesis of many approaches to personal development, based on traditional vedantic, tantric and yogic teachings in conjunction with contemporary physical and mental health sciences. The main components include karma yoga, hatha yoga, raja yoga, jnana yoga, kriya yoga as well as other yogas.

B.K.S. Iyengar has systematised over 200 classical yoga poses and 14 different types of Pranayama (with variations of many of them) ranging from the basic to advanced. This helps ensure that students progress gradually by moving from simple poses to more complex ones and develop their mind, body and spirit step-by-step.\textsuperscript{22}

Iyengar also targeted various ailments, diseases, and disorders with his practice. Chronic back pain, immunodeficiency, high blood pressure, insomnia, depression and menopause have specific

\textsuperscript{21} Retrieved from http://biharyoga.net/the-bihar-yoga-tradition on 4-8-2014

programs of yoga associated with them. Iyengar worked with those who had myocardial infections. The asanas are designed to be adjusted based on a person's stage of recovery.  

The more technical term for body fat is adipose tissue, with individual cells being called adipocytes (adipo = fat; cyte = cell). In humans, the primary type of fat cell is called white adipose tissue, or WAT, so named because of its color (it’s actually sort of a milky yellow). While there is another type of fat, called brown adipose tissue or BAT (which is actually reddish/orangeish), it’s generally been thought that humans didn’t have much BAT and hence it could be ignored.

Percent body fat is the percentage of fat your body contains. Exact body fat percentage cannot be precisely determined, but multiple methods are used to estimate it.

The healthy BMI range varies with the age and sex of the child. Obesity in children and adolescents is defined as a BMI

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greater than the 95th percentile. The reference data that these percentiles are based on is from 1963 to 1994 and thus has not been affected by the recent increases in rates of obesity. Childhood obesity has reached epidemic proportions in 21st century, with rising rates in both the developed and developing world. Rates of obesity in Canadian boys have increased from 11% in 1980s to over 30% in 1990s, while during this same time period rates increased from 4 to 14% in Brazilian children. As with obesity in adults, many different factors contribute to the rising rates of childhood obesity. Changing diet and decreasing physical activity are believed to be the two most important in causing the recent increase in the rates. Because childhood obesity often persists into adulthood and is associated with numerous chronic illnesses, children who are obese are often tested for hypertension, diabetes, hyperlipidemia, and fatty liver. Treatments used in children are primarily lifestyle interventions and behavioral techniques.

Human physiology is the science of the mechanical, physical, and biochemical function of humans, and serves as the foundation of modern medicine. As a discipline, it connects science, medicine, and
health, and creates a framework for understanding how the human body adapts to stresses, physical activity, and disease. Human physiology is closely related to anatomy, in that anatomy is the study of form, physiology is the study of function, and there is an intrinsic link between form and function. The study of human physiology integrates knowledge across many levels, including biochemistry, cell physiology, organ systems, and the body as a whole. Contemporary research in human physiology explores new ways to maintain or improve the qualities of life, development of new medical therapies and interventions, and charting the unanswered questions about how the human body works.26

The principal level of focus of physiology is at the level of organs and systems. Most aspects of human physiology, and animal experimentation has provided much of the foundation of physiological knowledge. Anatomy and physiology are closely related fields of study: anatomy, the study of form, and physiology,

26 Retrieved from http://physiology.uoregon.edu/undergraduate/ on 05-08-2014.
the study of function, are intrinsically tied and are studied in tandem as part of a medical curriculum.\textsuperscript{27}

Blood pressure (BP), sometimes referred to as arterial blood pressure, is the pressure exerted by circulating blood upon the walls of blood vessels, and is one of the principal vital signs. When used without further specification, "blood pressure" usually refers to the arterial pressure of the systemic circulation, usually measured at a person's upper arm. A person’s blood pressure is usually expressed in terms of the systolic pressure over diastolic pressure and is measured in millimeters of mercury (mm Hg). Normal resting blood pressure for an adult is approximately 120/80 mm Hg.

Blood pressure varies depending on situation, activity, and disease states, and is regulated by the nervous and endocrine systems. Blood pressure pathologically low is called hypotension, and pressure that is pathologically high is hypertension. Both have many causes and can range from mild to severe, with both acute and chronic forms. Chronic hypertension is a risk factor for many complications, including peripheral vascular disease, heart attack,

\textsuperscript{27}Retrieved from \url{http://en.wikipedia.org/wiki/Human_body} on 09-09-2014.
and stroke. Hypertension is generally more common, also due to the demands of modern lifestyles. Hypertension and hypotension go often undetected because of infrequent monitoring.\textsuperscript{28}

High systolic pressure during exercise in untrained people is a matter of concern. The combination of a high heart rate and systolic blood pressure suggest high oxygen consumption by the heart. In fact, the rate-pressure product is an excellent predictor of myocardial load. As discussed, rate-pressure product is systolic blood pressure multiplied by heart rate. If a person has heart disease, extreme levels of systolic blood pressure could easily result in myocardial hypoxemia. This is insufficient supply of oxygen to the heart.

Diastolic pressure changes low during exercise in normal people. Typically, there is either no change or a slight decrease of less than 10 mm Hg during exercise. There is also a small decrease during recovery of less than 4 mm Hg. A significant increase in diastolic pressure (> 15 mm Hg or above 110 mm Hg) is associated with a greater prevalence of coronary artery disease.

In the field of medicine, 'pulse' is defined as the rhythmic expansion and contraction of the arteries corresponding to each beat of heart. Simply put, it is the rate at which the human heart beats. The pulse rate of an individual can facilitate a quick evaluation of his health, and therefore, it is widely used as a diagnostic tool by medical practitioners. The rate at which your heart beats when you are resting is considered your normal pulse rate, and is measured in beats per minute (BPM). A pulse rate of 60-100 BPM is usually considered normal, but then, there exist a few exceptions to this rule. While a well-conditioned athlete can have a heart rate of 40 BPM, in a newborn the same can be as high as 180-190 BPM. Low pulse rate within the acceptable range is considered ideal, as it is an indicator of proper heart functioning and cardiovascular fitness. A fall below the normal range, however, can be a reason to worry. When the pulse falls below the normal range, the condition is referred to as bradycardia, and when it exceeds the normal range, it is referred to as tachycardia. The heart rate of an individual is influenced by several underlying factors; most prominent ones being gender, age, weight, emotions, medication, and lastly, the activity levels. The
activities that the person indulges in, can alter the person's heart rate in a short span of time. It can drop to 40 BPM when the person is sleeping, and spike to 150-200 BPM when he is exercising or indulging in some intense physical activity.\textsuperscript{29}

Breathing is regulated so the lungs can maintain the $P_{a_02}$ and $P_{a_co2}$ within normal range, even under widely varying conditions such as exercise.\textsuperscript{30}

High levels of cholesterol and triglycerides in the blood could cause high incidence of coronary heart disease. The incidence of CHD of a person with blood cholesterol of over 259 mg/100 ml of blood is nearly five times that of a person with blood cholesterol of under 200 mg per 100 ml. Cholesterol and other saturated fats make up the atherosclerotic deposits in the coronary arteries. A diet rich in animal fats and cholesterol is believed to be the main cause of high levels of cholesterol and triglycerides in the blood. However later studies have observed that not all kinds of cholesterol are dangerous, but only a few are said to be associated with CHD.

As lipids are insoluble, cholesterol cannot be carried in the blood in its original form. It has to be carried by protein molecules called lipoproteins, in which cholesterol is encompassed and carried to and away from the tissues. There are four types of lipoproteins; based on their density they are named High-Density Lipoprotein (HDL), Low-Density Lipoprotein (LDL), Very Low-Density Lipoprotein (VLDL) and Chylomicrons.

The main function of carbohydrates is to furnish energy to the millions of cells within the human body. Carbohydrates, which make up approximately 50 percent of the average American diet, are classified as either monosaccharides, disaccharides, or polysaccharides. All the carbohydrates in the diet must be reduced to monosaccharides by way of digestion before they can be used by the body as sources of energy. The most common or simplest monosaccharides (one that has single 6-carbon sugar molecule) carbohydrate is glucose which can be oxidized and used directly by the body for energy or it may be broken down by the digestive system and converted into glycogen (a polysaccharide) and stored in the muscle and liver for later use. It is interesting to note that once the
storage capacity for glycogen has been reached in the muscles and liver, the excess glucose is converted into fat and stored in the fatty (adipose) tissue of the body.\textsuperscript{31}

HDL is more tightly controlled by genetic factors than are the other lipoproteins (ie, LDL, VLDL, intermediate-density lipoprotein [IDL], and chylomicrons). For example, in certain families, especially some families with Japanese ancestry, a genetic deficiency of cholesteryl ester transfer protein (CETP) is associated with strikingly elevated HDL cholesterol levels. Very high levels of HDL cholesterol have been reported to be atherogenic. The mechanism of this paradoxical effect is not entirely clear.\textsuperscript{32}

**Statement of the Problem**

Yoga techniques affect body, internal organs, endocrine glands, brain, mind and other factors concerning body – mind complex. Various yoga techniques can be practiced effectively to


reduce the weight and achieve normal healthy condition of body and mind. Yoga positions or postures are especially useful to reduce the fats in various parts, especially forward bending, twisting and backward bending asanas help reduce the fats near abdomen, hips and other areas. Doing yoga decreases stress, improves flexibility and increases muscle tone and strength. So, the present study was intended to investigate the effect of different methods of yogic packages (Swami Satyananda Saraswathi (Bihar School) yoga and B.K.S. Iyengar yoga) on selected body composition measures (percentage of body fat and body mass index (BMI)), physiological (blood pressure (both systolic and diastolic), resting pulse rate and breath holding time) and biochemical variables (total cholesterol, triglycerides, high density lipoprotein and fasting blood glucose) among middle aged men.

**Hypotheses**

1. There would be significant positive changes in percentage of body fat, body mass index (BMI), blood pressure (both systolic and diastolic), resting pulse rate, breath holding time, total cholesterol, triglycerides, high density lipoprotein and fasting blood
glucose for both the training groups such as, Swami Styananda Saraswati (Bihar School) yoga practice group and B.K.S. Iyengar yoga practice group as compared to control group.

2. There would be significant difference in percentage of body fat, body mass index (BMI), blood pressure (both systolic and diastolic), resting pulse rate, breath holding time, total cholesterol, triglycerides, high density lipoprotein and fasting blood glucose between Swami Styananda Saraswati (Bihar School) yoga practice group and B.K.S. Iyengar yoga practice group.

**Delimitations**

1. For the study, 45 middle aged men with age between 35 and 40 years (mean ± S.D. 38.5 ± 0.5 years) were randomly selected.

2. Only male subjects who were residing in and around Kumbakonam town, Thanjavur District, Tamilnadu were selected as subjects.

3. The selected subjects were not familiar with yogasana or pranayama.

4. The subjects were randomly divided into three groups. Group - I (n = 15) underwent Bihar School of Yoga (Swami
Styananda Saraswati) practice, group – II (n = 15) underwent B.K.S. Iyengar yoga practice and group III (n = 15) acted as control.

5. Group – I and group – II have underwent their respective yoga practices for six days per week for twelve weeks, during which group - III did not participate in any specific training and remained as control group.

6. The criterion variables tested were percentage of body fat, body mass index (BMI), blood pressure (both systolic and diastolic), resting pulse rate, breath holding time, total cholesterol, triglycerides, high density lipoprotein and fasting blood glucose.

**Limitations**

1. The meteorological variations such as air, temperature, atmospheric pressure, relative humidity etc., during the testing periods could not be controlled and their possible influence on the result of the study was recognized as a limitation.

2. The subjects selected for the study were working women in different economical background. Therefore variations in their living conditions, life styles, diet etc., were recognized as a limitation of the study.
3. The general mood and environmental factors at the time of pre and post test periods, would have affected the response of the subjects, were recognized as a limitation of the study.

4. The participation of subjects of other physical activities as part of their habituation may affect the result of the study.

DEFINITIONS AND EXPLANATION OF TERMS

Yoga

Yoga is the system of philosophy and practice of esoteric meditation having as object the union of the individual human spirit with that of the universe.\(^{33}\)

Yoga is method by which one can remove ignorance, the cause of main folders and thus attain union with supreme self.\(^{34}\)

Yoga is the science of right living and, as such, is intended to be incorporated in daily life. It works on all aspects of the person: the physical, vital, mental, emotional, psychic and spiritual.\(^{35}\)


Pranayama

Pranayama is derived from 2 Sanskrit words – Prana (life force) and Ayama (control). Therefore, in its broadest description, Prananyama would mean the control of the flow of life force. To most, control of breath is Pranayama. However, this is a result of wrong interpretation.

The goal of Pranayama is to increase the quantum of this life force (Prana) so that it can reach out to 'hidden' recesses of the brain. This helps in expanding the human faculties and retarding degeneration.\(^\text{36}\)

**Percentage of Body Fat**

The body fat percentage of a person or animal is the total weight of fat divided by total weight; body fat includes essential body fat and storage body fat.\(^\text{37}\)


Body Mass Index

The body mass index (BMI), or Quetelet index, is a heuristic proxy for human body fat based on an individual’s weight and height.\(^{38}\)

Blood Pressure

Force that moves blood into arteries and drains blood from the arteries as blood moves through the circulatory system.\(^{39}\)

Systolic Blood Pressure

The pressure exerted on the vessel walls during ventricular contraction, measured in millimeters of mercury by the sphygmomanometer.\(^{40}\)

Diastolic Blood Pressure

The pressure exerted by the blood on the vessel walls during the resting portion of the cardiac cycle, measured in millimeters of mercury by a sphygmomanometer.\(^{41}\)

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**Pulse Rate**

Pulse rate is nothing but heartbeat and the number of time heartbeats per minute.\(^{42}\)

**Breath Holding Time**

Breath holding time is defined as the duration of time through which one can hold his/her breathe without in haling and exhaling after a deep inhalation.

Pulse rate is a wave of increased pressure, which is felt at the arteries when blood is pumped out of the heart.\(^{43}\)

**Cholesterol**

An odorless, tasteless, white fatty alcohol (sterol) found in all cell membranes and is vital to cell survival and growth. Cholesterol is also a key precursor or intermediate compound in the production by the body of numerous biologically important substances, collectively called steroids. These include various essential hormones plus bile acids, the major excretory product of cholesterol metabolism and also important in dietary fat. The human body


contains about 140-145 grams of cholesterol, which is constantly being used and replenished though at different rates in different tissues.\footnote{The Encyclopedia Americana, (Connecticut: Grolier Incorporated, 1984), p. 625.}

**Triglycerides**

Triglyceride is an ester of free fatty acids and glycerol, which are the main components of animal and plant lipids. They are the most concentrated source of usable energy in the human body and are stored as subcutaneous fat deposits where they contribute the insulation\footnote{Mickel Kent (ed), The Oxford Dictionary of Sports Sciences and Medicine, (Oxford: Oxford University Press, 1994), p. 462.}.

**High-density Lipoprotein**

High-density lipoprotein cholesterol is a group of proteins found in the blood plasma and lymph that are combined with lipids. They transport cholesterol from the tissue to the liver to be broken down and excreted.\footnote{Mickel Kent (ed), The Oxford Dictionary of Sports Sciences and Medicine, p. 205.}

**Fasting Blood Glucose**

Glucose levels are usually lowest in the morning, before the first meal of the day (termed "the fasting level"), and rise after meals
for an hour or two by a few millimolar. Blood sugar levels outside the normal range may be an indicator of a medical condition. A persistently high level is referred to as hyperglycemia; low levels are referred to as hypoglycemia. Diabetes mellitus is characterized by persistent hyperglycemia from any of several causes, and is the most prominent disease related to failure of blood sugar regulation.\(^{47}\)


**SIGNIFICANCE OF THE PROBLEM**

Currently, physicians are giving preference to yoga and are introducing it in centers of teaching learning. The significance of the study is based on the fact that yogasanas can be a valuable tool to improve body composition measures, physiological and biochemical capacities. The significances of the study are,

1. The result of the study would be of great interest to yogis, yoga therapists, middle-aged men and women and diabetic patients, as they would be able to assess the changes in physical fitness, physiological and biochemical variables.

2. The findings of the study will be of great value is designing and administrating ring, yoga therapy camps, yoga
awareness camps, physical fitness programmes and remedial programmes for those who need such special attention.

3. The study will reveal the effect of practicing different packages of yoga on percentage of body fat, body mass index, blood pressure, resting pulse rate, breath holding time, total cholesterol, triglycerides, high density lipoproteins and blood glucose.

4. The result of the study will be useful for middle-aged men and women to do yoga as a tool to improve their fitness level and to cure various diseases.

5. The results of the study will be useful to overcome stress and strain.

6. This study would add to the quantum of knowledge in the area of fitness, physiology and biochemistry.