Chapter I

INTRODUCTION

Yoga is a systematic practice for the realization of higher perceptions. It is the science of life and an ideal way of living, providing rhythm to the body, melody to the mind, harmony to the soul and thereby symphony to life. In short, Yoga is a way to achieve total health, peace, bliss and wisdom. Physical, mental and spiritual aspects of yoga help to make one’s life purposeful, useful and noble. Thus Yoga is an art, science and philosophy, which influence the life of man at each level. Therefore, the effect of yoga must be felt in every movement of our day- to- day lives.

Yoga is an ancient Indian science which teaches man how to live in unity within himself and with those around him. It is recognized as one of the most important and valuable heritages of India. More than 2000 years ago our ancestors developed it to bind the body, mind and spirit, as a harmonious whole. It has been growing in popularity with unbelievable rapidity over the years. Today the whole world is looking towards yoga for answers to the various problems the modern man is facing.

Yoga is a way of life. It is an integrated system of education for the body, mind and inner spirit. This art of right living was perfected and practiced in India thousands of years ago but, as yoga deals with universal truths, its teachings are valid today as they were in the ancient times. Yoga is a practical aid, does not belong to one religion and its techniques could be practiced by the Buddhists, Jews, Christians, Muslims, Hindus and the Atheists alike. Yoga is union with all. It brings peace to the human beings by physical practices with or without a toner on spiritualism.

As we live in the age of modern science and technology, our lifestyle has become very fast. It is also becoming very hard and difficult to live a natural and normal life because of the changing scenario of the world. The very air is becoming unfit for human consumption. Our cities are growing noisier, dirtier and congested. All these do create tension. The mind is always under strain due to various social evils. When we are under stress, our digestion is not proper and we may suffer from
some fairly serious ailments like Asthma and Spondilytis etc., and yoga comes to our rescue at this juncture.

In the treatment of almost all the chronic disorders and ailments, yoga can assist in a big way, when practiced along with other streams of treatment. However it is not a panacea for all health problems. It has its own limitations. At the same time, it cannot cure the acute infective disorders of traumas. Obviously it is not possible to carry out surgical operations with its help. But it can definitely help in the post operational therapy, under able guidance 2.

The key to the whole problem is “self help”. First of all, everyday one should learn how to release and remain released. Learn how to breath properly, reduce weight if need be, and take up walking regularly as an exercise. We cannot totally avoid being ill and we have our “off days” once in a while, but through yoga we can become resilient. We can acquire the energy to overcome the pressures and survive in the stressful conditions. Therefore, yoga teaches us how to be one with the world by being one with ourselves.

The Aim of Yoga

The aim of yoga is to attain perfection of the intellect, both of the head and the heart, so that, the artist becomes devoted, true and pure. This demands an almost total relinquishment of interest in other activities of life except the chosen path. The mind is fluid and runs after sensual pleasures. Art demands total undivided focal attention. Hence Patanjali explains that the mind must be controlled and then submitted to serve the artistic nature of yoga to its highest potency. Yoga or any art requires acute sharpness of intellect and alert organs of perception. In yoga there is no competition but it requires freedom to think and reconstruct with a desire to perform better. Then it brings to the yogi the most exalted enlightenment. From now on, wherever the yogi is and whatever he does, his thoughts are rooted in spiritual communion, which takes him to the Zenith of spiritual life 3.

The Indian classical thought holds salvation as the ultimate objective of human endeavor. This ideal of achieving salvation (moksha) can be attained by the four different ways viz. Karma yoga, Bhakti yoga, Raja yoga and Gyana yoga etc.
We shall in the time allotted briefly consider ‘Raja yoga’ or ‘Astanga yoga’ as propounded by Maharishi Patanjali and Swami Vivekananda.

Meaning and Concept of Yoga

The word “Yoga” is derived from the Sanskrit root “Yuj” which means union, joining, harnessing, contact, or connection. It is union between the individual self and the universal self. It is the fusion of a healthy body with a disciplined mind for the purpose of spiritual development. Yoga is also blissful contact with the supreme element, higher than the highest of the known elements. It is the harnessing of one’s inherent inner power, as well as the wider natural forces from which one has emerged. Yoga is an inseparable part of the Indian life and culture. It has come down to us from antiquity with an unbroken tradition.

Integration encompasses putting together and controlling the same judiciously. This is consistent with the definition of Yoga in “Bhagavad Gita” which says, “Smatvameva Yoga Uchyate” that is equanimity is called Yoga. It means that yoga remains equipoised in success and failure, gain and loss, victory and defect etc. The term ‘Samatva’ may also be translated as equilibrium, which leads to harmonious development of the physical, mental and spiritual aspects of human personality. Equanimity and equilibrium are thus the essential traits of Yoga. They help in the skilful performance of an action.

Yoga as an Art

Yoga is an art in all its aspects, from the most practical to the highest. It is a spiritual art, in the sense that it transforms the seer and brings him into contact with his inner soul. It is a fine art, since it is aesthetic, expressive, visual art, since the body is made to form geometrical designs, lines architectural shapes and the like which are beautiful to behold. It is essentially a useful art for the doer and is presented as a performing art for viewer.

The art of yoga is creative, rhythmic in practice and individualistic in nature. It is ennobling. It is the purest of knowledge where wisdom begins and investigates into the nature as being as love is experienced by the lover and the beloved.
As living is an art, yogic enhances the quality of one’s life. Hence it is an art. It improves one’s thought process and enables one to face life’s difficult situations happily and with equanimity. It teaches one to strive to achieve a goal in life, to cultivate friendliness, concentration, piety, contentment, joy and more essentially to discard what is not essential to life and to cultivate good habits to lead a righteous life. Yoga is disciplined action to achieve and attain final emancipation.

Yoga as a Science

Yoga is considered as a full fledged science. The science of yoga consists of acquiring knowledge through observation and experiment. It is a science, which deals with the body and mind controlling the body through the practice of Yoga to achieve the rhythm of mind. The health and strength of the body and the mind are acquired, only when a state of equilibrium is attained whereby the body and the mind are balanced. Like all other arts, Yoga is also a science as well as a philosophy too. As science is concerned with analyses Yoga too is bent on analysis.

Yoga analyses the turbulent mind and shows the ways and means of reaching the ultimate goal of freedom. As any other science, yoga too conveys truth. On a practical level, yoga keeps the body healthy the mind quite and pure, and self in beatitude. It is therefore a darsana. The practical aspect of yoga darsana conveys the artistic aspect of Yoga with its precision and beauty.

The science of yoga works on physical, mental, emotional, psychic and spiritual aspects of a person, when imbalance is experienced at this level, the organs, muscles and nerves no longer function in harmony, rather they act in opposition to one another. Therefore, yoga aims at bringing the different bodily functions into perfect co-ordination so that they work for the good at the whole body. Therefore yoga develops the personality of an individual mentally, morally, spiritually and intellectually.

The Eight Stages of Raja Yoga

By observing their own thoughts, scientifically and objectively, the ancient yogis studied the many obstacles in bringing the mind under conscious control. Sage
Patanjali who lived in 320 A.D was a great saint of his time and was reverently called as ‘Patanjali Maharishi’. His greatest contribution to the science and philosophy of yoga is rendered in the form of patanjali yoga sutras. His main scheme of yoga is popularly known as Raja yoga or Ashtanga yoga, a text that describes the inner workings of the mind, and also provides an eight stepped (ashtanga) blueprint for controlling the restless mind and enjoying lasting peace. The eight stepped blueprint or stages are 1. Yama – Social Discipline, 2. Niyama – Personal Discipline, 3. Asanas – Postures, 4. Pranayama – Breath control, 5. Pratyahara – Withdrawal of senses, 6. Dharana – Concentration, 7. Dhyana – Meditation, 8. Samadhi – Union.

If these eight stages are practiced and followed in life, virtues like morality, (morally sound conduct) and good character would develop in man. Besides, there would be an all round progress in human life- physical, intellectual and spiritual and man would attain physical fitness and mental equanimity.

Keeping in view of the significance and relevance of yoga in one’s life, the researcher has made an attempt to experiment it in practical life so as to study and analyze its effects concretely.

ASANAS

Asana is derived from the verb root “as” which means “to sit”, “to remain”, etc., According to Patanjali, Asana is defined as, “SITHRAM SUKHAM ASANAM”-PYS 11:46 meaning, that position which is comfortable and steady. Therefore asana means, a state of being in which one can remain physically and mentally steady, calm, quite and comfortable.

Yogasanas are not to design muscles, but rather to bring the whole body to the peak of physical perfection and top efficiency by a series of carefully designed position. All the asanas, which have an effect on the diaphragm, help to massage the heart and at the same time it also massages the abdominal organs. They are not as exercise for reducing or increasing weight. By virtue of their effect on the endocrine system which regulates the entire system, they help to keep the body in proper shape and to increase the power of resistance. They have a curative, recuperative and preventive effect because they are based on deep breathing which can work wonders.
Asanas are postures, which contribute to stability and sense of well-being. The stability here refers not merely of the posture but of the mind and the body as a whole. There were originally 84,00,000 asanas representing 84,00,000 incarnations.

**Classification of Asanas**

Asana can be classified into three major groups:

**Cultural asana:** This group includes maximum number of asanas, which are meant for re-conditioning of the body and mind so as to bring stability, peace and a sense of well being.

**Relaxative asana:** Shavasana and makarasana are two important relaxative asanas, which bring about relaxation of the body and mind. They eliminate the physical as well as mental tensions.

**Meditative asanas:** These asanas provide a comfortable and stable sitting position of the body to make the mind more steady for the process of meditation.

**Physiological Significance of Cultural Asanas**

- To re-condition various joints, the muscles around and their tendons as well as the reflex mechanisms are put in order to offer a stable and comfortable posture for higher practices like pranayama, dhyana, etc.,

- It also helps maintain an optimum muscle tone in the body.

- To establish physiological balance among various systems for their harmonious function.

- Provides the best organic vigour to the individual.

- In most of the asanas, the abdominal area is influenced and undergoes pressure changes which are reflected on the visceral organs like stomach, colon, urinary bladder, lungs etc.,
Physiological Significance of Relaxative Asana

- Horizontal and relaxed position of the body on the ground facilitates efficient and easy blood circulation.
- Blood pressure and heart rate are reduced.
- Relieves muscular tension as well as engages the mind properly to such a form where new simulations are not expected.
- Enables established balance in all the functions of the body.

Physiological Significance of Meditative Asana

- The visceroreceptors and proprioceptors in the coccygeal, sacral and lumbar are stimulated due to special arrangement of the hip joints stretching of pelvic region.
- The static stretching and maintained rotation of the knee joints squeeze the blood vessels and press the capsule. When the meditative asana is released the fresh blood supply improves its conditions. A regular practitioner will never experience pain in the knee joints.
- The meditative asana provides steady, stable and comfortable sitting position and helps in controlling and concentrating the mind for meditation.

Pranayama

Pranayama is an exact science. It is the regulation of breath or control of prana which is the stoppage of inhalation and exhalation, that follows after securing that steadiness of posture or seat, Asana. As the Bible states, “Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living being.”- Gen 2:7.

The Sanskrit word prana means ‘vital force’ or ‘cosmic energy’. It also signifies ‘life’ or ‘breath’, Ayama means the control of the prana. Hence pranayama means control of the vital force by concentration and regulated breathing. It is
physical, mental, spiritual and cosmic energy. All forms of energy are prana. Prana is usually translated as breath; which moves in the thoracic region absorbing vital energy; yet, this is the only one of its many manifestations in the body. (Ayama means control). So pranayama is the science of breath control. The movements of the thoracic organs include vertical ascension, horizontal expansion and a circumferential movement.

**The Varieties of Pranayama**

Svatmaram, the author of Hathapradipika mentions eight varieties of pranayama not on the basis of nature of kumbhaka but on the basis of nature of inhalation and exhalation, which are gone through before and after kumbhaka. They are: 1) Suryabhedana, 2) Ujjai, 3) Sitkari, 4) Sitali, 5) Bhastrika, 6) Bhramari, 7) Murchha, 8) Plavini.

The inspiration, retention and expiration are to be gone through in pranayama in a controlled manner, each phase lasting for several seconds. These temporal factors (i.c) Prolongation of a particular phase for a considerable length of time is of primary importance not only in pranayama but also in other yogic practice.

**Physiology of Pranayama**

It has been proved beyond doubt that pranayama is a very important means for preventing and curing many ailments. Pranayama brings about several physiological changes in the body.

The science of pranayama teaches us how to reduce the respiratory and heart rate, while increasing the quantum of oxygen drawn in and decreasing the outflow of breath. This can be as minimal as two or three cycles per minute. When the respiratory rate is thus lowered, the metabolic rate of the body also reduces. The body is brought to a state of temporary hibernation. All the cells are rested, and relaxation is ensued. The sympathetic overdrive is reduced, with consequent energy conservation. In pranayama, the mind is kept attentive so that the rhythm of breathing is regulated. The frontal brain, which is the seat of intellectual activity, is made quiet. Complete neuro – physiological relaxation occurs.
Pranayama can be used for therapy. The problem of low and high blood pressure, allergic rhinitis, vasomotor rhinitis, sinusitis, recurrent infections of the upper respiratory tract, chronic headaches, migraine, peptic ulcers, anxiety states, can all be treated by the many kinds of pranayama, without the need for asanas.

**Meditation**

Meditation is the act of focusing one’s thoughts or engaging in self – reflection or contemplation. Some people believe that, through deep meditation, one can influence or control physical and psychological functioning and the course of illness.

Meditation is a state of consciousness that can be understood only on a direct, intuitive level. Ordinary experiences are limited by time, space, and the laws of causality, but the meditative state transcends all boundaries. While you meditate, past and future cease to exist. There is only the consciousness of I AM in the infinite, eternal, Now.

By constant meditation, one slowly gains knowledge of the self, and gets freed from bondages, not merely the external ones, but in one’s inner consciousness. The ultimate goal of life is salvation and this, the scriptures say, is attained through knowledge of the ultimate truth of the self and its place in the cosmic self, gained through meditation.

“Meditation is the royal road to the attainment of freedom a mysterious ladder that reached from earth to heaven, darkness to light, Mortality to Immortality.”

Meditation is a process that anyone can use to calm oneself, cope with stress, and, for those with spiritual inclinations, feel as one with God or the universe. Meditation can be practiced individually or in groups and is easy to learn. It requires no change in belief system and is compatible with most religious practices.

**Regularity is the key**

For effective practice of meditation, regularity of time, place, and practice are most important, as they condition the mind to focus its energies. The mind seems to be particularly active. When you try to concentrate, but just as any habit can be
established through constant practice, so the mind can be conditioned to focus more quickly once regularity is established.\textsuperscript{13}

The tools of meditation are responsible for creating an atmosphere where the mind can get centered into one's own inner self. Then the mind gets so much at peace that we can reach the stage between sleep and waking. This is the Alfa state. Even when one is hypnotizing a person, he/she uses the Silva mind control method; one actually brings the mind to this state itself, the only difference being that in the other methods some inputs are given to the mind while in meditation, the divine energies are allowed to put the inputs.

\textbf{Physical Benefits}

Meditation provides a lasting spiritual rest, which must be experienced and to be understood. Once you can meditate; the time you normally devote to sleep can gradually be reduced to as little as three hours per night, and you will still feel more rested and peaceful than before. By reducing heart rate and consumption of oxygen, meditation greatly reduces stress levels. It seems that each part of the body, even down to the individual cells, is taught to relax and rejuvenate. Meditation helps to prolong the body’s period of growth and cell production, and reduces the decaying process. After the age of 35, our brain cells die off at a rate of 1000,000 per day, and they are not replaced, but meditation can reduce this decline, as it changes the vibratory make-up of both the body and mind. In this way, meditation can prevent or minimize senility.

\textbf{Mental Benefits}

We each possess vast inner resources of power and knowledge much of it brought with us from past lives. In meditation, new patterns of thinking come to the surface and develop as we experience a new view of the universe, a vision of unity, happiness, harmony, and inner peace. Negative tendencies vanish, and the mind becomes steady. Meditation brings freedom from fear of death, which is seen a doorway to a new name and form. People who meditate regularly land to develop magnetic and dynamic personalities, cheerfulness, powerful speech, lustrous eyes, physical health, and boundless energy. Others draw strength from such people and
feel elevated in their presence. Meditation is only possible when all mental modifications (thought waves) have been stilled, and with this comes mental peace.\(^{14}\)

**Role of Silence in Meditation**

Meditation involves silence. Silence is absence of words and sounds that appear internally or externally. While referring about silence, we generally think of silence around us. But in meditation, the silence that is more important is the silence within. This is not to be forced. It has to be achieved by giving total freedom to the mind. The most important of this is silence. God is friend of silence. We need to find God, but we cannot find Him in noise, in excitement. See how nature, the trees, the flowers, the grass grow in deep silence. See how the stars, the moon, and the sun move in silence. The more we receive in our silent prayer, the more we can give in our active life. Silence gives us a new way of looking at everything.\(^{15}\)

**Biochemistry of Blood Glucose and Lipoproteins**

**Blood Glucose**

Carbohydrate metabolism provides glucose, the primary energy source for human body. After ingestion of carbohydrates and absorption of glucose, blood glucose level raises. The concentration of glucose is controlled by the action of several hormones. Glucose can be synthesised denovo or stored in tissue as glycogen. The concentration of glucose in the blood is regulated by a complex interplay of multiple pathways, modulated by a number of hormones. Insulin is a hormone that decreases the blood glucose and glucagons increase it. The main concern of glucose is related with the disease diabetes mellitus, which is a group of metabolic disorders of carbohydrate metabolism in which glucose is under utilized producing hyperglycemia which produces many complications in diabetic patients. Elevation of fasting glucose over 126 mg/dl more than one occasion is diagnostic of diabetes mellitus.\(^{16}\)

**Fat Transport**

Fat absorbed from the diet and lipids synthesized by the liver and adipose tissue must be transported between the various tissues and organs for utilization and storage. Since lipids are insoluble in water, the problem of transport of them in the
aqueous blood plasma is solved by associating nonpolar lipids (triacylglycerol and cholesteryl esters) with amphipathic lipids (phospholipids and cholesterol) and proteins to make water miscible. During meals in the human, excess calories are ingested in the feeding cycle, followed by a period of negative caloric balance when the organism draws upon its carbohydrate and fat stores. Lipoproteins mediate this cycle by transporting lipids from the intestines as chylomicrons and from the liver as very low density lipoproteins (VLDL) to most tissues for oxidation and to adipose tissue for storage. Lipid is mobilized from adipose tissue as free fatty acids (FFA) attached to serum albumin. Abnormalities of lipoprotein metabolism cause various hypo- or hyperlipoproteinemias. The most common of these is diabetes mellitus. Most other pathologic conditions affecting lipid transport are due primarily to inherited defects, some of which cause hypercholesterolemia, and premature atherosclerosis. Obesity is a risk factor for increased mortality, hypertension, type 2 diabetes mellitus, hyperlipidemia, hyperglycemia, and various endocrine dysfunctions.

**Lipids are Transported in the Plasma as Lipoproteins**

Plasma lipids consist of triacylglycerols (16%), phospholipids (30%), cholesterol (14%), and cholesteryl esters (36%) and a much smaller fraction of unesterified long-chain fatty acids (free fatty acids) (4%). This latter fraction, the free fatty acids (FFA), is metabolically the most active of the plasma lipids. Because fat is less dense than water, the density of a lipoprotein decreases as the proportion of lipid to protein increases (Table 25–1). In addition to FFA, four major groups of lipoproteins have been identified that are important physiologically and in clinical diagnosis. These are (1) chylomicrons, derived from intestinal absorption of triacylglycerol and other lipids; (2) very low density lipoproteins (VLDL), derived from the liver for the export of triacylglycerol; (3) low-density lipoproteins (LDL), representing a final stage in the catabolism of VLDL; and (4) high-density lipoproteins (HDL), involved in VLDL and chylomicron metabolism and also in cholesterol transport. Triacylglycerol is the predominant lipid in chylomicrons and VLDL, whereas cholesterol ester is the predominant lipids in LDL and phospholipids is the predominant lipids in HDL, respectively the structure of the lipoprotein is presented in figure I.
The nonpolar lipid core consists of mainly triacylglycerol and cholesteryl ester and is surrounded by a single surface layer of amphipathic phospholipid and cholesterol molecules (Figure 1). These are oriented so that their polar groups face outward to the aqueous medium. The protein moiety of a lipoprotein is known as an apolipoprotein or apoprotein, constituting nearly 70% of some HDL and as little as 1% of chylomicrons.

**a. The Chylomicrons**

Chylomicrons are the largest of the lipoproteins and the least dense because of their rich triacylglycerol content. They are synthesized from dietary lipids within the epithelial cells of the small intestine and then secreted into the lymphatic vessels draining the gut. They enter the bloodstream. The major apoproteins of chylomicrons are apoB-48, apoCII, and apoE. The apoCII activates lipoprotein lipase (LPL), an enzyme that projects into the lumen of capillaries in adipose tissue, cardiac muscle and skeletal muscle. This activation allows LPL to hydrolyze the chylomicrons, leading to the release of free fatty acids derived from core triacylglycerides of the
lipoprotein into these target cells. The muscle cells then oxidize the fatty acids as fuel while the adipocytes and mammary cells store them as triacylglycerols (fat). The partially hydrolyzed chylomicrons remaining in the bloodstream (the chylomicron remnants), now partly depleted of their core triacylglycerols, retain their apoE and apoB48 proteins. Receptors in the plasma membranes of the liver cells bind to apoE on the surface of these remnants, allowing them to be taken up by the liver through a process of receptor-mediated endocytosis.

b. Very-Low-Density Lipoproteins (VLDL)

If dietary intake of fatty acids exceeds the immediate fuel requirements of the liver, the excess fatty acids are converted to triacylglycerols, which, along with free and esterified cholesterol, phospholipids, and a variety of apoproteins, including apoB-100, apoCII, and apoE, are packaged to form VLDL. These particles are then secreted from the liver into the bloodstream. The density, particle size, and lipid content of VLDL particles are given in. These particles are then transported from the hepatic veins to capillaries in skeletal and cardiac muscle and adipose tissue, where lipoprotein lipase is activated by apoCII in the VLDL particles. The activated enzyme facilitates the hydrolysis of the triacylglycerol in VLDL, causing the release of fatty acids and glycerol from a portion of core triacylglycerols. These fatty acids are oxidized as fuel by muscle cells, used in the resynthesis of triacylglycerols in fat cells. The residual particles remaining in the bloodstream are called VLDL remnant.

Intermediate-Density Lipoprotein (IDL) and Low-Density Lipoproteins (LDL)

Approximately half of the VLDL remnants are not taken up by the liver but, instead, has additional core triacylglycerols removed to form IDL, a specialized class of VLDL remnants. With the removal of additional triacylglycerols from IDL through the action of hepatic triglyceride lipase within hepatic cells LDL is generated from IDL. The LDL particles are rich in cholesterol and cholesterol esters. Approximately 60% of the LDL is transported back to the liver, where its apoB-100 binds to specific apoB-100 receptors in the liver cell plasma membranes, allowing particles to be endocytosed into the hepatocyte. The remaining 40% of LDL particles are carried to extrahepatic tissues that also contain apoB-100 receptors, allowing them to internalize the LDL particles and use their cholesterol for the synthesis of steroid hormones. If an
excess of LDL particles is present in the blood, this specific receptor-mediated uptake of LDL by hepatic and nonhepatic tissue becomes saturated. The “excess” LDL particles are now more readily available for nonspecific uptake of LDL by macrophages present near the endothelial cells of arteries. This exposure of vascular endothelial cells to high levels of LDL is believed to induce an inflammatory response by these cells, a process suggested to initiate the complex cascade of atherosclerosis discussed below. \(^7\)

**High Density Lipoprotein**

HDL particles can be created by a number of mechanisms. The first is synthesis of nascent HDL by the liver and intestine as a relatively small molecule whose shell, like that of other lipoproteins, contains phospholipids, free cholesterol, and a variety of apoproteins, predominant among which are apoA1, apoAII, apoCI, and apoCII. Very low levels of triacylglycerols or cholesterol esters are found in the hollow core of this early or nascent HDL.

**a. Maturation of Nascent HDL**

In the process of maturation, the nascent HDL particles accumulate phospholipids and cholesterol from cells lining the blood vessels. As the central hollow core of nascent HDL progressively fills with cholesterol esters, HDL takes on a more globular shape to eventually form the mature HDL particle. The transfer of lipids to nascent HDL does not require enzymatic activity.

**b. Reverse Cholesterol Transport**

A major benefit of HDL particles derives from their ability to remove cholesterol from cholesterol filled cells and to return the cholesterol to the liver, a process known as reverse cholesterol transport. This is particularly beneficial in vascular tissue; by reducing cellular cholesterol levels in the subintimal space, the likelihood that foam cells (lipid-laden macrophages that engulf LDL) will form within the blood vessel wall is reduced. Reverse cholesterol transport requires a directional movement of cholesterol from the cell to the lipoprotein particle. Cells contain the protein ABC1 (ATP-binding cassette protein 1) which uses energy to move
cholesterol from the inner leaflet of the membrane to the outer leaflet. Once the cholesterol has reached the outer membrane leaflet, the HDL particle can accept it. To trap the cholesterol within the HDL core, the HDL particle acquires the enzyme LCAT Lecithin Cholesterol Aeyl Transferase from the circulation (LCAT is synthesized and secreted by the liver). LCAT catalyzes the transfer of a fatty acid from the lecithin (phosphatidylcholine) in the phospholipid shell of the particle to the cholesterol, forming a cholesterol ester. The cholesterol ester migrates to the core of the HDL particle and is no longer free to return to the cell.

Elevated levels of lipoprotein-associated cholesterol in the blood, particularly that associated with LDL but also that in the more triacylglycerol-rich lipoproteins, are associated with the formation of cholesterol-rich atheromatous plaque in the blood vessel wall, eventually leading to diffuse atherosclerotic vascular disease resulting in acute cardiovascular events, such as a myocardial infarction, a stroke, or symptomatic peripheral vascular insufficiency. High levels of HDL in the blood, therefore, are believed to be vasculoprotective, because these high levels increase the rate of reverse cholesterol transport “away” from the blood vessels and “toward” the liver. The structure of the Transport and Lipoprotein between tissues presented in figure II.

Figure – II

TRANSPORT CHOLESTEROL AND LIPOPROTEIN BETWEEN TISSUES
Psychology

Many texts define psychology as the “science of mental processes and behaviour.” However, ‘Psychology’ is difficult to define because the word “mental” suggests there are no boundaries or limits. “Psyche”, in “Psychology” also suggests breath, life, soul or mind – all of which are without limit.

Mental Health

The modern concept of health extends beyond the proper functioning of the body. It includes a sound, efficient mind and controlled emotions. ‘Health is a state of being hale, sound or whole in body and mind’. It means that both body and mind work efficiently when they are in perfect harmony. Man is an integrated psychosomatic unit whose behaviour is determined by both physical and mental factors. Mental health means the ability to balance feelings, desires, ambitions and ideals in one’s daily living.

Yoga and Mental Health

The science of yoga is not only for the body, it is also for the mind. Even though a child or an adult may be crippled in body, he or she is more than likely to be perfectly sound in mind. Yoga helps individuals develop their latent mental facilities and intelligence to the fullest possible extent.

Characteristics of Mental Health

Mental health is far more than freedom from mental disease. It means the ability to live comfortably with oneself and others, to understand and accept one’s own feelings, to make nature and appropriate emotional responses to situations, to be creative, to deal with anxiety and stress, to endure frustration, to gain satisfaction from constructive achievement and to use leisure time profitably.

A person in good mental health is a) comfortable in his environment, b) has self–respect, c) knows his capabilities and limitations, d) maintains control over his emotions, e) accepts both success and failure equally, f) enjoys the company of people, g) is capable of being a member and leader in a group, h) accepts
responsibility, i) is capable of making his own decisions, j) makes and abides by reasonably prompt decisions, and k) establishes realistic goals in life\textsuperscript{22}.

A mentally healthy person is one who has a wholesome and balanced personality free from schisms and inconsistencies, emotional and nervous tensions, discards and conflicts. Wallace-Wallin has defined mental hygiene as “the application of a body of hygienic information and technique called from sciences of psychology, child study, education, sociology, psychiatry, medicine and biology for the purpose of observation and improvement of mental health of the individual and of the community”\textsuperscript{23}.

Self concept

The formation of self-concept is fundamental to the development of the individual’s personality. Hence, self-concept means how a person thinks or feels about him/her self. It may be positive or negative.

In recent years, there has been growing realization of the importance of self-concept in understanding and predicting the human behaviour. A self-concept is an understanding that one is separate and independent person\textsuperscript{24}.

The beginning of a self-concept actually occurs within the first year or two of life. As early as nine months of age, infants look at themselves and smile in a mirror. However, they do not seem to distinguish that the image is self as opposed to any particular infant. By around 15 months of age, children do begin to show evidence of self-recognition. By 18 to 20 months of age, nearly all infants have developed at least a rudimentary concept of self They show self-conscious behaviour in front of a mirror and can recognize themselves in a picture or videotape\textsuperscript{25}.

Children with a positive self-concept are described as imaginative, confident in their own judgments and abilities, assertive, able to assume leadership roles, less preoccupied with themselves, and able to devote more time to others and to external activities.

Children with a negative self-concept are described quiet, unobtrusive unoriginal, lacking in imitation, withdrawn and inartificial about themselves (Copper
Smith, 1967). School progress and academic achievement are influenced by self-concept as in vocational choice.

Self-concept represents how a person sees himself or herself and it is thought to have three components: ideal self (the person one would like to be); public self (the image one believes others have of oneself); and real self (the sum of those subjective thoughts, feelings, and needs that a person sees as being authentically his). Sometimes there is a conflict between the different components of self resulting in anxiety. To maintain good mental health, the public and ideal self should be compatible with the real self. The self-concept is different from self-Consciousness, which is an awareness or preoccupation with one’s self. The components of the self-concept include physical, psychological, and social attributes, which can be influenced by the individual’s attitudes, habits, beliefs and ideas. These components and attributes can not be condensed to the general concepts of self-image and the self-esteem.

**Personality**

Personality is total being of a man. It includes physical as well as mental make up sensation, reflexes, instincts, emotions, perceptions, imaginations, memory, intelligence, reasoning, will and characters.

Personality is in some sense an organization that characterizes an individual. It is an individuals enduring persistent response pattern across a variety of situations. It is comprised of relatively stable patterns of action often referred to as traits, dispositions tendencies, motivation, attitudes and beliefs which are confined into more or less integrated self structure. Personality includes the characteristics and attributes that distinguish the individual from others. It consists of the varied and yet typical efforts at adjustment that are carried out by the individual.

As personality includes everything about a person, it is not static. It is dynamic and even in the process of change and modification. Personality is the total quality of an individual behaviour as it is shown in his habits of thinking, his interest, his manner of acting and his Personal life. Personality can be changed only when the person is willing to undergo a process of re-education under expert guidance. The
term personality denotes social attractiveness. Personality cannot be demonstrated, measured and qualified, but it is recognized as a unique pattern of trait which characterizes the individual.

Every day we are changing, yet all these changes do not break our continuity with the past, so far as there is a unity in all pursuits and past experiences, there is a personality that can be said to exist in us.

“We are not the same today as we were a year ago. Many things happened in the year. If we should compare ourselves, now with what we were a year ago in the same way we would hardly recognize ourselves, yet we are the same personality.”

Therefore, personality is the sum total of all the biological innate dispositions and tendencies acquired by experience and frequently used as a product of social interaction. It is seen as influencing, guiding and motivation behaviour. Presumably it makes people unique and causes them to act or see situations differently from others.

**Eysenck Personality Concepts**

Eysenck has given an impetus to the investigations in the field of personality study, through his scientific works. He considered himself a “cautious psychologist unwilling and unable to make statements unless they are the result of replicable research, statistically controlled and openly reported.

Eysenck’s theory on personality for better understanding of human behaviour can be analysed on the basis of the following four principles.

a) Biological Principles

b) Methodological Principles

c) Dynamic or structural and

d) Learning principles

Eysenck’s biological principles are applied on nervous system. It is revealed by Eysenck himself in a note sent to Bischor. He considers introversion –
extroversion operate at the casual level in the neural systems and Neuroticism is believed to come from the excitability of the autonomic nervous systems, on the other hand extroversion and introversion are based on the properties of the central nervous systems entailed the reactionary conclusion that psychological and social traits are biologically predetermined.

In Soviet psychology, Extroversion – Introversion manifestation critically reviewed from Marxist positions is regarded as properties of temperament, i.e. as dynamic (not substantive) characteristics of mental process that serve as premises for development of specific personal qualities.

In this work, Eysenck has identified three primary dimensions of personality.

<table>
<thead>
<tr>
<th>Introversion (super ego)</th>
<th>Extroversion (id)</th>
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<tr>
<td>Neuroticism</td>
<td>Non neuroticism</td>
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<td>Psychoticism</td>
<td>Non Psychoticism</td>
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According to Carl, the extroverted type directs his interests outwards, and surrounding objects attract his vital interests and ‘vital energy’ like a magnet; in a sense this leads to his alienation from himself, to belittlement of the personal significance of his subjective world. Extroverts are characterized by impulsiveness, initative, flexibility of behaviour and social adaptability. Conversely introverts direct their interests inwards, towards their own thoughts and feelings, to which they ascribe supreme value; they are also characterized by unsociability, reticence, social passiveness, tendency towards self-analysis and difficult social adjustment.

**Statement of the problem**

The purpose of this study is to determine the effect of the twelve weeks of select yogasanas, pranayama and meditation training on biochemical, physiological and psychological variables of male students.
Hypotheses

It was hypothesised that there would be significant effects on biochemical, physiological and psychological variables as a result of twelve weeks of yogasanas pranayama and meditation practice when compared with the control group.

Delimitations

1. The study was restricted to forty college male students in the Union Territory of Puducherry.

2. Forty male students were selected for the study, of which twenty was considered as the control group and the remaining twenty as the experimental group.

3. The age of the selected subjects ranged from 18 to 23 years and all of them were healthy and normal.

4. The twelve weeks of yogasanas, pranayama and meditation training were given for the experimental group.

5. The criterion variables selected for the study were confined to the following select yogasanas, pranayama and meditation on biochemical, physiological and psychological variables.

6. In the present study the following variables were selected, namely

a. Biochemical Variables

   i. Blood glucose

   ii. Total cholesterol

   iii. Triglycerides

   iv. High density lipoprotein

   v. Low density lipoprotein.

   vi. Very low density lipoprotein
b. Physiological Variables

i. Vital capacity
   a. Forced vital capacity
   b. Forced expiratory volume in first second (FEV₁)
   c. Peak expiratory flow rate (PEFR)

ii. Blood pressure
   a. Systolic blood pressure
   b. Diastolic blood pressure

iii. Pulse rate

iv. Rate pressure product

v. Respiratory pressure
   a. Maximum expiratory pressure
   b. Maximum inspiratory pressure
   c. Breath holding time

c. Psychological variables

i. Mental health

ii. Self – concept

iii. Personality
Limitations

1. The heredity and environmental factors which influence the criterion variables were recognized as limitations.

2. The mood of the subjects which prevailed at the time of the training period also could not be controlled.

3. The state of feeling and environment factors while responding to the psychological questionnaire by the subjects and their responds have also been taken into account.

4. Certain factors like rational habits like life style, daily routine, diet and climatic condition were not taken into account in this study.

5. The uncontrollable changes in the climatic conditions such as atmospheric temperature, humidity, etc., during pre and post test period were considered as limitations.

6. The subjects economic situation was not taken into consideration.

Definition and Explanation of the Terms

Yoga

Yoga is a method by which one can obtain control of one’s latent powers. It offers the complete means to self realisation\textsuperscript{31}.

Yoga is a timeless pragmatic science evolved over thousands of years dealing with the physical, moral and spiritual well being of a man as a whole\textsuperscript{32}.

Pranayama

Pranayama means control of life force through the art of breathing\textsuperscript{33}. Pranayama means breath control. In Sanskrit, prana means breath and ayama means a control. In modern literature on yoga, prana, even in the compound pranayama, has been often interpreted to mean a subtle psychi force or a subtle cosmic element\textsuperscript{34}. 
Prana means a subtle life force which provides energy to different organs (including mind) and also controls many vital life processes (e.g. circulation, respiration etcetra). Ayama signifies the voluntary effort to control and direct this prana.

Meditation

Meditation essentially means temporary freedom thoughts. Unlike sleep, it is a “wakeful” thought – free state, in which all our senses are alert and awake. In fact, during meditation, we are many times more alert and awake than during our day-to-day life. It is a state of mind in which our thinking process comes to an end for a short period of time. During meditation, one experiences a complete stillness.

Lipid Profile

Lipids are insoluble in water but are soluble in alcohol and other solvents. When dietary fats are digested and absorbed into the small intestine, they eventually re-form into triglycerides, which are then packaged into lipoproteins.

Cholesterol

Cholesterol is the fatty substance formed in the blood. Cholesterol is a white fatty alcohol of steroid group, found in body tissue, blood and bile, assists in synthesis of vitamin D and various hormones. Excessive deposits of cholesterol on inside of arteries are associated with arteriosclerosis and coronary heart disease.

Total Cholesterol

Cholesterol is a sterol, a lipid found in the cell membranes of all body tissues, and is transported in the blood plasma of all animals. Because cholesterol is synthesized by all eukaryotes, trace amounts of cholesterol are also found in membranes of plants and fungi.

Triglycerides
Triglycerides are the chemical forms in which most fat exists in food as well as in the body. They are also present in blood plasma and in association with cholesterol, form the plasma lipids. Triglycerides in plasma are derived from fats eaten in foods or made in the body from other energy sources like carbohydrates.

**High Density Lipoprotein Cholesterol**

High Density Lipoproteins comprise the smallest protein of lipoproteins and the largest quantity of protein. These High Density Lipoproteins may be associated with risk of heart disease.

Lipoproteins, which are combinations of lipids (fats) and proteins, are the form in which lipids are transported in the blood. The high-density lipoproteins transport cholesterol from the tissues of the body to the liver so it can be gotten rid of (in the bile). HDL cholesterol is therefore considered the “good” cholesterol. The higher the HDL cholesterol level, the lower the risk of coronary artery disease.

**LDL Cholesterol**

Low density lipoprotein is the major cholesterol carrying lipoprotein. Elevated LDL levels herald a strong predisposition to coronary heart disease, stroke and peripheral vascular disease.

Lipoproteins, which are combinations of lipids (fats) and proteins, is the form in which lipids are transported in the blood. The low-density lipoproteins transport cholesterol from the liver to the tissues of the body. LDL cholesterol is therefore considered as “bad” cholesterol.

**VLDL Cholesterol**

Very-low-density lipoprotein (VLDL) cholesterol is one of the three major types of blood cholesterol combined with protein. As triglyceride levels are reduced, so are VLDL levels. Foods that are high in glycemic index tend to stimulate VLDL cholesterol production.

**Vital Capacity (VC)**
Vital capacity is the sum of the tidal air and the inspiratory and expiratory reserve volumes.\textsuperscript{46}

**Forced Vital Capacity (FVC)**

Forced vital capacity is defined as the maximal volume of air which a person can expel from his lungs by a forcible expiration after the deepest possible inspiration.\textsuperscript{47}

**Forced Expiratory Volume in first second (FEV\textsubscript{1})**

After inspiring maximally, the subject expires maximally into a Spirometer and a percentage of total capacity expired in the first second is calculated.\textsuperscript{48}

**Peak Expiratory Flow Rate (PEFR)**

It is found more convenient and informative to measure the rate at which one liter of air is expelled over the fastest part of the expiratory curve and express this as maximum forced expiratory flow rate or peak flow rate.\textsuperscript{49}

**Blood Pressure (BP)**

The pressure measured in the vascular system that is associated with cardiac contraction (systolic) and relaxation (diastolic).\textsuperscript{50}

**Systolic Blood Pressure (SP)**

“The highest level to which the arterial blood pressure rises during the systolic ejection of blood from the Ventricle”\textsuperscript{51}

“Systolic Blood Pressure is the highest blood pressure of the Cardiac cycle occurring immediately after systolic of the Ventricles of the heart”\textsuperscript{52}

**Diastolic Blood Pressure (DP)**

“Diastolic Pressure is the lowest arterial blood pressure of the cardiac cycle occurring during diastolic of the heart”\textsuperscript{53}

**Pulse Rate**
The number of beats of a pulse per minute or the number of the beats of the heart and entries per minute\(^54\). The number of beats felt in exactly in one minute is known as pulse rate.

**Maximum Expiratory Pressure (MEP)**

The subject is asked to blow against a mercury column after taking in a full breath to (TLC) and to maintain the column at the maximum level of two seconds\(^55\).

**Maximum Inspiratory Pressure (MIP)**

The subject is asked to perform maximal inspiratory effort against the mercury column after breathing out fully (RV). The maximum inspiratory pressure that could be maintained for two seconds is taken as MIP\(^56\).

**Breath Holding Time**

It is the duration of time through which one can hold his breath without inhaling or exhaling after a deep inhalation\(^57\).

**Mental Health**

Mental health is defined as a state of personal mental well being in which individuals feel basically satisfied with themselves, their roles in life, and their relationship with others\(^58\).

Mental health is the measure of a person’s ability to shape his environment to adjust to life as he has to face it and to do so with a reasonable amount of satisfaction, success, efficiency, and happiness\(^59\).

**Self Concept**

Self concept can be conceived as a set beliefs about self, that are presumed to be dominant feature in social perception and resulting in attributional and self-conceptional process\(^60\).

Self concept is ‘the experience of one’s own being. It is an organized cognitive structure comprised of a set of attitudes, beliefs and values that cut across
all facets of experience and action, organizing and trying together a variety of specific habits, abilities, outlooks, ideas and feelings that a person displays\textsuperscript{61}.

**Personality**

Personality is described in terms of an individual’s behaviours – his action, postures, words, and attitudes and opinions regarding his external world\textsuperscript{62}.

According to Woodworth, personality can be broadly defined as the total quality of an individual’s behaviour, as it is revealed in his habits of thought and expression, his attitudes and interests, his manner of acting and his personal philosophy of life\textsuperscript{63}.

**Significance of the Study**

The finding of the study would reveal the effect of select yogasanas, pranayama and meditation on biochemical, physiological and psychological variables of male students.

1. The study would provide scientific base and guidance to the physical educationist, coaches and players to understand the effect of select yogasanas, pranayama and meditation on biochemical, physiological and psychological variables of male students.

2. The present study would give some basic knowledge to the sports scientists to conduct further research in the area of physiological, biochemical and psychological variables.

3. The result of the study would add to the quantum of knowledge in the area of sports training, exercise biochemistry and exercise physiology related to yogasanas, pranayama and meditation.

4. This study will help to create awareness among the citizens to understand the importance of yogic training.
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