EFFICACY OF ISOLATED ASANA PRANAYAMA AND SURYANAMASKAR TRAINING ON SELECTED PHYSIOLOGICAL BIO-CHEMICAL AND PSYCHOMOTOR ABILITY VARIABLES OF COLLEGE MEN

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Submitted by

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This thesis is his original work and it has not previously formed the basis for the award to any candidate, for any degree, diploma, associate ship or other similar titles. This thesis represents, entirely an independent work on the part of the candidate but for the general guidance by me.

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DECLARATION BY THE SCHOLAR

I, **P. MADANA KUMAR**, part time scholar of Doctor of Philosophy, in Sri Ramakrishna Mission Vidyalaya Maruthi College of Physical Education hereby declare that the thesis entitled **"EFFICACY OF ISOLATED ASANA PRANAYAMA AND SURYANAMASKAR TRAINING ON SELECTED PHYSIOLOGICAL BIO-CHEMICAL AND PSYCHOMOTOR ABILITY VARIABLES OF COLLEGE MEN''** Submitted to Tamil Nadu Physical Education and Sports University for the award of **DOCTOR OF PHILOSOPHY IN PHYSICAL EDUCATION** is my original work and it has not previously formed the basis for the award of any degree, diploma associate ship, fellowship or any other similar titles to any candidate of any University.

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Dedicated to

My Family

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INTRODUCTION

The term “Yoga” and the English word “Yoke” are derived from Sanskrit root “Yuj”. This means “Union”. Yoga is a psychosomatic - spiritual discipline for achieving union, and harmony between our mind, body and soul with ultimate union of our individual consciousness with means the universal consciousness. Yoga is not a religion. It is a philosophy of life, based on certain psychological facts, and its aim is to development of a perfect balance between the body and mind, that permits union with the divine bliss. A perfect hormone between the individual and the cosmos. People from all walks of life that arrived at the highest degree of knowledge through the discipline of yoga – which carrying on their various occupations.

Yoga works on the mind and the body simultaneously, as well as exploits their interdependence. But no other system does this. Western psychology studies the mind, and western exercise physiology studies the effect of exercise on the body, but there is no emphasis on the interrelationship of the mind and body. Yoga deals with the physical, physiological and mental effect in a positive manner. Yoga shows us the happiness is within ourselves and trying to quench desires is like pouring ghee on the fire which only makes it blaze more instead of putting it out. So with the desire, it is never satisfied. Yoga shows us the happiness for which we are eternally searching can be obtained through non-desire. To achieve a state of non-desire, the mind must be trained to think clearly and healthily, required a healthy body. (Iyengar 2001).

Yoga provides one of the best means of self improvement and helps to attain one's full potential. In the advanced stages of yoga the super conscious states are attained which results feeling of bliss, deep peace and the emergence of psychic powers. Yoga was developed and perfected over the centuries by the philosophers and the mystics in India. It is basic method of increasing the body's supply of energy and removes any interference to the transmission of energy throughout the body. Yoga has specialized in this subject for thousands of years, and stream lined the methods to attain the self improments in all the way of human life style.

The word Yoga automatically calls to mind Sage "Patanjali" the founder and father of Yoga. He lived around three centuries before Christ, and was a great philosopher and grammarian. He was also a physician. His best known work is Patanjali Yoga Sutras of Aphorisms on Yoga. The path outlined is called Raja Yoga. Yoga is a science of right living and it works when integrated in our daily life. It works on all aspects of the person: the physical, mental, emotional, psychic and spiritual. The main aim of Yoga is to help one connect with one's inner spirit, which is connected to the universal spirit or God. Yoga creates a balance between the body and the mind and to attain self-enlightenment. Yoga brings stability to the body and the wavering mind. In order to accomplish it, Yoga makes use of different movements, breathing exercises, relaxation technique and meditation.

Yoga is associated with a healthy and lively lifestyle with a balanced approach to life. It is the union between the mind, body and spirit. It involves the training of physical postures and poses, which is referred to as 'Asana' in Sanskrit. Yoga is helps one achieve optimum physical and psychological health. It is a system of physical, mental and

spiritual techniques. 30 million people training Yoga on regular basis. Yoga is the most rapidly growing health movement of today, despite having existed for thousands of years already.

Yoga is essentially a spiritual discipline based on an extremely subtle science, which focuses on bringing harmony between mind and body. It is an art and scince of healthy living. The word ‘Yoga’ is derived from the Sanskrit root ‘Yuj’, meaning ‘to join’ or ‘to yoke’ or ‘to unite’. As per Yogic scriptures the practice of Yoga leads to the union of individual consciousness with that of the Universal Consciousness, indicating a perfect harmony between the mind and body, Man & Nature. According to modern scientists, everything in the universe is just a manifestation of the same quantum firmament. One who experiences this oneness of existence is said to be in yoga, and is termed as a yogi, having attained to a state of freedom referred to as mukti, nirvana or moksha. Thus the aim of Yoga is Self-realization, to overcome all kinds of sufferings leading to 'the state of liberation' (Moksha) or ‘freedom’ (Kaivalya). Living with freedom in all walks of life, health and harmony shall be the main objectives of Yoga practice."Yoga” also refers to an inner science comprising of a variety of methods through which human beings can realize this union and achieve mastery over their destiny.Yoga, being widely considered as an ‘immortal cultural outcome’ of Indus Saraswati Valley civilization – dating back to 2700 B.C., has proved itself catering to both material and spiritual upliftment of humanity. (Iyengar 1999)

1.1 MEANING OF YOGA

The word is derived the sankrit root “Yuj” meaning to bind ,join attach and yoke, to direct the concentration on to use and apply. it istrue union of our will with the will of God. (Iyengar 2006)

1.2 BENEFITS OF YOGA

Yoga encourages weight loss and improves the body's sensitivity to insulin. The relaxation exercises in yoga regulates blood to all parts of the body. Exercises such as handstand, helps venous blood from the lower part of the body to flow back to the heart, where it can be pumped back to the lungs to be oxygenated.

"Yoga can also lower blood pressure and reduce insomnia." Other physical benefits of yoga include: increased flexibility, increased muscle strength and tone.

Many people view yoga as just a fancy form of stretching. But the benefits of yoga go well beyond that. Along with being a great stress reliever, yoga can improve your flexibility, strength, posture and breathing and lung capacity. These benefits apply to both men and women: Yoga improves flexibility. Yoga poses work by safety stretching your muscles and all other soft tissues in your body. No matter what your yoga-level is, you will likely feel the benefits within a short period of time. Yoga improves strength. Some styles of yoga are more vigorous than others. But no matter what type of yoga you're doing, you will improve your core strength. This type of functional is very useful for every day life and beneficial as you age. Yoga improves posture. Increased flexibility and strength helps you improve your posture. With better core strength and the body awareness you create by practicing yoga, you are more likely to recognize when you are slouching or have bad posture and correct it. Yoga improves breathing and lung capacity. Most forms of yoga emphasize long and deep breathing. This can help expand your lung capacity and improve endurance. (Christopher Hutton, 2014)

Asana is traditionally defined as a “seat.” Most commonly, it is the seated posture used for meditation. More typically now in yoga, the term is used for any physical posture of Hatha yoga. (Iyender 2008)

1.3 MEANING OF ASANA

The term “asana” which is part of most of the Sanskrit pose names. “Asana” is defined as any of the yogic postures or movements, but literally translates to “seat.” It's said that originally the only posture in yoga was a comfortable seat taken for long periods of mediation. (Iyengar 2008)

1.3.1 Asana

In Patanjali’s Yoga Sutras, asana is defined as a "steady, comfortable posture." The sutras do not specify any particular poses, but require simply that in practicing asanas, a position which is both steady and comfortable should always be sought.

Historically, texts and teachers have described different numbers of asanas. The classic texts of Hatha yoga refer to 84 asanas as taught by Lord Shiva, often with the first four of these being considered necessary to achieve spiritual perfection. These are siddhasana, padmasana, bhadrasana and simhasana.

Other teachers and texts have suggested that there are as many asanas as there are beings; 8.4 million, one for each living creature in the universe. Sri Dharma Mittra, a yoga teacher well-respected by the contemporary schools of Iyengar, Ashtanga Vinyasa and Sivananda yoga, catalogued a list of 1,300 yoga asanas.

It is recommended that asanas are practiced with an empty stomach and without using excessive force or pressure. Asanas can be combined with pranayama practice to

enhance the benefits of the poses. They should always be practiced with mindful awareness, uniting the body, mind and breath. Specific asanas can be practiced to help alleviate specific health problems or physical issues.

Asana practice is considered important by yogis because it helps to keep the physical body healthy. Given that the body is the vehicle for the spirit, looking after the physical body is important for spiritual development. Practicing asanas can also have a range of emotional and energetic benefits, increase discipline and concentration, and ready the mind for meditation.

There are many benefits of asana practice in general. Asanas help to increase flexibility and strength. They stimulate all of the physiological systems of the body, including the circulatory, immune and digestive systems. They help develop the mindfulness and focus needed for meditation. On a more subtle level, they are said to stimulate the energetic body, opening the chakras and the nadis.

An asana is a body posture, originally sitting for meditation, and later in hathayoga and modern yoga, including reclining, standing, inverted, twisting, or balancing as well as seated poses. The 5th century BC Yoga Sutras of Patanjali define "asana" as "to be seated in a position that is steady but relaxed".

Modern yoga has evolved with a focus on exercise, strength, flexibility, and breathing. It can help boost physical and mental well-being. It consists of 26 poses and a sequence of two breathing exercises. Hatha yoga: This is a generic term for any type of yoga that teaches physical postures

Yogi and mystic Sadhguru explores the incredible life and capabilities of Patanjali, the father of modern yoga and the author of the celebrated yoga sutras. (Nagendra 1993).

1.4 PRANAYAMA

Pranayama is the formal practice of controlling the breath, which is the source of our prana, or vital life force. Here, read up on pranayama exercises & poses, breathing techniques and sequences.

Some major types of pranayama yoga are as follows: Nadi Sodhana, Shitali Pranayama, Ujjayi Pranayama, Kapalabhati Pranayama, Digra Pranayama, Bhastrika Pranayama, Bahya Pranayama, Bhramari Pranayama.

Deep rhythmic breathing and alom vilom are the pranayama everybody can do. You can increase the duration of these pranayama gradually and you can do each of these upto say 30 minutes. While doing pranayama anytime you feel tired or discomfort stop your pranayama practice and take rest.

It is recommended to do pranayama early in the morning, one to two hours before sunrise when oxygen content is maximum in the air. Also, early morning body is fresh and mind is clear from any thought processes. An empty stomach is ideal for pranayama. (Sukhdev Singh et al., 2011)

1.4.1 Essential Guidelines for Pranayama

Here are some essential guidelines for pranayama to start the practice of pranayama at home. These are guidelines are for reference only and people can modify these as per any specific condition in consultation with yoga teacher.

It is recommended to do pranayama early in the morning, one to two hours before sunrise when oxygen content is maximum in the air. Also, early morning body is fresh

and mind is clear from any thought processes.An empty stomach is ideal for pranayama. Early morning, food consumed during previous day is digested.

Pranayama to be practiced in a well ventilated, clean and uncluttered room with plenty of free space for yoga mat and free movement. There should not be any noises which may distract your mind.

Alternatively, pranayama can be practiced outdoors in a garden or a lawn provided weather is neither too cold nor too hot. Do not practice outdoors when strong wind is blowing. Avoid practicing yoga under a fan or an air conditioner as it may disturb the body temperature and cause chills. (Vivekananda Kendra Prakahan (1997)

1.4.2 Cautions for Pranayama

Patients of asthama or hypertension should not hold breath. Avoid Bhastrika and Surya-bhedi Pranayama in summers and Shitkari, Shitali and Chandra-bhedi in winters. Avoid Kapalabhati pranayama during pregnancy. If any one suffering from any breathing problem, first consult the doctor before doing pranayama. Also, it is advisable to learn from an experienced yoga teacher who can explain in detail the guidelines for pranayama and subtle differences in posture and technique. Strictly avoid smoking as it will nullify the effect of doing pranayama.

1.4.3 Proper Breathing Guidelines for Pranayama

The breathing should not be jerky or hasty, it should be patient and rhythmic enjoying each breath. Draw in breath at a continuous flow rate. The process of breathing in and out should be smooth so as not to make a noise during the process.

Always breathe through nose unless required for particular pranayama. The breathing must be full yogic breathing, a smooth blend of abdominal, chest and clavicular breathing in a simple rhythm.

Pranayama should be a refreshing experience. While doing Pranayama, forget about the worries and stress in life and try to concentrate on the breath. Do not strain yourself while doing pranayama. Strain destroys the benefits of the exercise.

A long inhalation, a short pause while holding the breath, then a long exhalation is the basic pattern to follow. Ideally the proportion of inhaling, holding breath and exhaling is in the ration 1:4:2. So you have to exhale more slowly than inhaling.

For a beginner, holding of breath is not recommended. Once you become comfortable with asanas and pranayama practice, start practice of holding breath. Gradually increase holding of breath.

The correct way to breathe is to expand the muscles of the diaphragm down and out, then push in and up during inhalation and exhalation respectively. In this way the lungs expand to full capacity, air rushes into them, and then it is vigorously expelled. But very few of us breathe this way naturally.

Any time in state of uncomfortable feel during pranayama practice, stop the exercises. Breathe normally, relax and take rest in shavasana.

A beginner can start practice of Pranayama keeping in mind these guidelines for pranayama. For beginners, rhythmic deep breathing and alom vilom (alternate nostril breathing) are the easiest pranayama for beginners.

As per eight fold path of yoga, an individual must first practice asanas for few days to condition his / her body and thereafter start pranayama. During the daily yoga practice, start the yoga sequence with asanas followed by pranayama.

Some people do not practice asanas and just do pranayama only. Pranayama practice alone can improve the concentration, and revitalise your body and mind. These guidelines for pranayama are by no means exhaustive, one can add more based on his / her experience.

In Patanjali's "Ashtanga yoga", Pranayama appears at the fourth stage. This means unless one observes Yama-Niyama and does Asanas well, he cannot reach this fourth stage. Even the Asanas discussed here are presented in their preliminary form. Therefore, for doing Pranayama, it is not enough to have done the Asanas as mentioned here. Even after learning these Asanas and having practiced them, one needs some preparation before actually taking up Pranayama. And an attempt is made to discuss that preparation. Actual Pranayama means the holding up of the process of exhaling and inhaling. And it is not possible to discuss or guide this serious aspect of Yogabhyasa in preliminary discussion. Therefore, as the preliminary exercises are discussed and which are to be done before the actual beginning of the Asanas: similarly, for Pranayama too, the preliminary exercises of breathing are designed.

Before examining the exercises of breathing it is necessary to understand the process of breathing. The breathing process chiefly involves two activities, viz., inhaling and exhaling. Of these the former is called "Puraka" and the latter "Rechaka"' in Yogashastra. These two activities continue non-stop right from the birth to the death of a person. The state when these two activities are made to halt is given the name

"Kumbhaka" in Yoga Studies. The halt after inhaling, i.e., Puraka is called "Abhyantara Kumbhaka" and after exhaling, i.e. rechaka. It is called "Bahya Kumbhaka".

1.4.4 Preparation for Pranayama

As people have attraction towards Yogasanas, similarly they have attraction to Pranayama. The process of Pranayama is concerned with the breathing, the indicator of life. And therefore, if it is done wrongly, it may do harm to the person. This fear dissuades many from taking up Pranayama. The second reason for its unpopularity is the absence of teachers who can teach it scientifically. However, it is true that if one does Pranayama unscientifically, without proper guidance, one certainly suffers. But it does not mean that it is such a difficult process, that it cannot be done by a common man. On the contrary, if it is learnt and practiced under an expert's guidance, one learns soon and experiences the wonderful and even unimaginable benefits.

1.4.5 Pranayama (From Hatha Yoga and Astanga Yoga)

"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.

Is a Sanskrit word alternatively translated as "extension of the prana (breath or life force)" or "breath control." The word is composed from two Sanskrit words: prana meaning life force (noted particularly as the breath), and either ayama (to restrain or control the prana, implying a set of breathing techniques where the breath is intentionally altered in order to produce specific results) or the negative form ayāma, meaning to extend or draw out (as in extension of the life force). It is a yogic discipline with origins in ancient India.

‘Prana’ refers to the universal life force and ‘ayama’ means to regulate or lengthen. Prana is the vital energy needed by our physical and subtle layers, without which the body would perish. It is what keeps us alive. Pranayama is the control of prana through the breath. These techniques rely on breathing through the nostrils.

Prana flows through thousands of subtle energy channels called ‘nadis’ and energy centers called ‘chakras’. The quantity and quality of prana and the way it flows through the nadis and chakras determines one’s state of mind. If the Prana level is high and its flow is continuous, smooth and steady, the mind remains calm, positive and enthusiastic. However, due to lack of knowledge and attention to one’s breath, the nadis and chakras in the average person may be partially or fully blocked leading to jerky and broken flow. As a result an individual experiences increased worries, fear, uncertainty, tensions, conflict and other negative qualities.

The ancient sages of India realized these breathing techniques. Some common pranayamas include Bhastrika, Kapalabhati, and Nadishodan pranayama. Regular

practice increases and enhances the quantity and quality of prana, clears blocked nadis and chakras, and results in the practitioner feeling energetic, enthusiastic and positive. Practiced correctly under the right supervision prananyama brings harmony between the body, mind and spirit, making one physically, mentally and spiritually strong. (Acharya et al., 2010)

1.4.6 Special Instructions for Pranayama

In the early morning, answer the calls of nature and sit for the practice. Practise Pranayama, in a dry well-ventilated room. Pranayama requires deep concentration and attention. It is always better to have the practice in a steady sitting posture. Do not keep anything which distract the mind. Before start for Pranayama practice, thoroughly clean the nostrils well. Have a small quantity of fruit-juice or a small cup of milk or coffee even before the practice. After completion of the practice take a cup of milk or light tiffin after 10 minutes. Have one sitting only in the morning during summer. Do Sitali Pranayama to cool the body heat.

Strictly avoid too much talking, eating, sleeping, mixing with friends and exertion. “Verily Yoga is not for him who eateth too much, nor who abstaineth to excess, is addicted to too much sleep nor even to wakefulness” (Gita VI-16). Take a little ghee with along with rice in the meals. This will lubricate the bowels and allow Vayu to move downwards freely.

“Mitaharam vina yastu yogarambham tu karayet, Nanaroga bhavettasya kinchid yogo na sidhyati Without observing moderation of diet, if one takes to the Yoga practices, he cannot obtain any benefit but gets various diseases” (Ghe.S. Chap. V-16).

Perfect celibacy for six months or one year will doubtless enable an indidual to acquire rapid progress in the practice and in spiritual advancement. Be regular and systematic in the practice. Never miss a day. Stop the practice during ill health. Some people twist the muscles of the face when they do Kumbhaka. It should be avoided. It is a symptom to indicate that they are going beyond their capacity. This must be strictly avoided.

Obstacles in Yoga: “Sleeping in day time, late vigil over night, excess of urine and faeces, evil of unwholesome food and laborious mental operation with Prana.” When one is attacked by any disease, he says that the disease is due to the practice of Yoga. This is a serious mistake.

Get up at 4 a.m. Meditate or do Japa for half an hour. Then do Asanas and Mudras. Take rest for 15 minutes. Then do Pranayama. Physical exercises can be conveniently combined with Asanas. If time permits have the Pranayama practice after finishing all the Yogic exercises and meditation. Pranayama can also be performed as soon as get up from bed just before Japa and meditation. It will make the body light and will enjoy the meditation. A routine should be followed according to the convenience and time.

Maximum benefit can be derived if Japa also is done during the practice of Asanas and Pranayama. It is always better to start Japa and meditation in the early morning at 4 a.m., as soon as get up from bed. At this time the mind is quite calm and refreshed. A person can have good concentration.

As there is always some drowsiness at the time of get up from bed, it is desirable to do some Asanas and a little Pranayama for five minutes just to drive off this drowsiness and to prepare for meditation. The mind gets one-pointed after the practice of

Pranayama. Pranayama, though it concerns with the breath, gives good exercise for various internal organs and the whole body.

The general order of doing Kriyas is: First do all Asanas, then Mudras, then Pranayama and then Dhyana. Since the early morning time is suitable for meditation, a person can follow this order: Japa, Meditation, Asanas, Mudras and Pranayama. This is a better way. One can follow the order which is suitable to him. After doing Asanas, take rest for five minutes and then begin Pranayama.

Some Hatha Yogic books interdict cold bath in the early morning. Probably the reason may be that one may catch cold or develop any complaint of the lungs, if he takes cold bath at 4 a.m. particularly in cold places like Kashmir, Mussoorie, Darjeeling, etc. There is no restriction in hot places. Prefer cold baths before one starts the Yogic practices as it is refreshing and stimulating. It drives off drowsiness. It brings in equilibrium of circulation of blood. There is a healthy flow of blood towards the brain.

Asanas and Pranayama remove all sorts of diseases, improve health, energise digestion, invigorate the nerves, straighten the Sushumna Nadi, remove Rajas and awaken Kundalini. Practice of Asanas and Pranayama bestows good health and steady mind. As no Sadhana is possible without good health and as no meditation is possible without a steady mind, Hatha Yoga is of immense use for Dhyana Yogins, Karma Yogins, Bhaktas and Vedantins as well.

The maintenance of the body is impossible without Asanas or any kind of physical exercises or activities. Even an orthodox Vedantin is an unconscious Hatha Yogi. He practises some kind of Asana daily. He practises Pranayama also unconsciously because during meditation, Pranayama comes by itself.

Whenever a person feel uneasy, depressed or dejected, can practise Pranayama then he will be at once filled with new vigour, energy and strength. He will be elevated, renovated and filled with joy. Do this and try. Be regular in the practice. Regularity in the practice is very necessary if one wants to realise the maximum benefits of Asanas and Pranayama. Those who practise by fits and starts will not derive much benefit. Generally people practise for two months in the beginning with great enthusiasm and leave off the practice. This is a sad mistake. They always want a Yogic teacher by their side. They have got the effeminate leaning mentality. They are lazy, torpid and slothful.

People do not want to remove Mala (impurity) by selfless service and Vikshepa by Yogic practices. They at once jump to awaken the Kundalini and raise Brahmakara Vritti. They will only break their legs. Those who attempt to awaken the Kundalini by Asanas and Pranayama, should have purity in thought, word and deed. They should have mental and physical Brahmacharya. Then only they can enjoy the benefits of awakening the Kundalini.

Sow the seed of spirituality in the young age. Do not waste Virya. Discipline the Indriyas and mind. Do Sadhana. After become old, it will be difficult to do any rigid Sadhana. Therefore be on the alert during the young age.

During advance in spiritual practices, a person must observe strict Mouna (vow of silence) for 24 hours continuously. This must be continued for some months also. Everyone should select a course of few exercises in Asana, Pranayama and meditation according to one’s temperament, capacity, convenience and requirement.

It is quite possible for a man to practise celibacy, albeit there are various sorts of temptations and distractions. A well-disciplined life, study of scriptures, Satsanga, Japa,

Dhyana, Pranayama, Sattvic and moderate diet, daily introspection, and enquiry, self-analysis and self-correction, Sadachara, practice of Yama, Niyama, physical and verbal Tapas, all will pave a long way in the attainment of this end. People have irregular, unrighteous, immoderate, irreligious, undisciplined life. Hence they suffer and fail in the attainment of the goal of life. Just as the elephant throws sand on its own head, so also they themselves bring difficulties and troubles on their own heads on account of their foolishness.

Do not shake the body unnecessarily. By shaking the body often the mind also is disturbed. Do not stretch the body every now and then. The Asana should be steady and firm as a rock when doing Pranayama, Japa and meditation. An individual must find out for himself according to the health and constitution what sort of dietetic regulation will suit and what particular Pranayama will exactly help him. Then only one can safely proceed with his Sadhana.

Do not take bath immediately after Pranayama is over. Take rest for half an hour. If any one get perspiration during the practice, do not wipe it with a towel. Rub it with the hands. Do not expose the body to the chill draughts of air when you perspire. Always inhale and exhale very slowly. Do not make any sound. In Pranayamas like Bhastrika, Kapalabhati, Sitali and Sitkari, one can produce a little mild or the lowest possible sound.

A person should not expect the benefits after doing it for 2 or 3 minutes only for a day or two. At least he must have 15 minutes daily practice in the beginning regularly for days together. There will be no use if a person jump from one exercise to another everyday.

The Puraka is otherwise known as ‘Nissvasa’ and Rechaka is known as ‘Uchhvasa’. The mental process in Kevala Kumbhaka is called ‘Sunyaka’ form of breath regulation.

Steady, systematic practice and gradual increase of Kumbhaka is known as ‘Abhyasa Yoga’, swallowing of air and living on this air alone is known as ‘Vayubhakshana’.

The author of sivayoga dipika describes three kinds of Pranayama: Prakrita, Vaikrita and Kevala Kumbhaka. “If the Prana is in the form of breath inhaled and exhaled, on account of its natural quality of going out and coming in, the Pranayama is known as Prakrita. If the Prana is restrained by the threefold means of throwing out, taking in and stopping the breath in accordance with the rules prescribed in the Sastras, it is called Vaikrita or artificial. But with great men who have risen above these two kinds of restraining breath, the sudden restraining of the vital currents directly (without inspiration and expiration), is Kevala Kumbhaka. Prakrita Pranayama belongs to Mantra Yoga. Vaikrita belongs to Laya Yoga.”

“That is called Kumbhaka (cessation of breath) when there is neither expiration nor inspiration and the body is motionless, remaining still in one state. Then he sees forms like the blind, hears sounds like the deaf and sees the body like wood. This is the characteristic of one who has attained quiescence.” (Sarswathi, Swamy Sathyananda (2008).

Patanjali does not lay much stress on practice of different kinds of Pranayama. He mentions: “Exhale slowly, then inhale and retain the breath.” It is only the Hatha Yogins who developed Pranayama as a science and have mentioned various exercises to suit different persons. Sit for the Pranayama practice facing the North.”

Some would take the order as exhaling, inhaling and retaining; others as inhaling, retaining and exhaling. The latter is more common. In Yajnavalkya, we find the different kinds of breath regulation mentioned in the order of Puraka, Kumbhaka and Rechaka;

whereas, in Naradiya text we have them in the order of Rechaka, Puraka and Kumbhaka. The two are to be regulated as optional alternatives.

A Yogi should always avoid fear, anger, laziness, too much sleep or waking and too much food or fasting. If the above rule be well strictly practised, each day, spiritual wisdom will arise of itself in three months without doubt; in four months, he sees the Devas; in five months he knows or becomes a Brahmanishtha; and truly in six months he attains Kaivalya at will. There is no doubt.

A neophyte should do Puraka and Rechaka only without any Kumbhaka for some days. Take a long time to do Rechaka. The proportion for Puraka and Rechaka is 1:2. Pranayama in its popular and preparatory form may be practised by every one in any posture whatsoever, sitting or walking; and yet is sure to show its benefits. But to those who practise it in accordance with the specific methods prescribed, fructification will be rapid.

Gradually increase the period of Kumbhaka. Retain for 4 seconds in the first week, for 8 seconds in the second week, for 12 seconds in the third week and so on, till one is able to retain the breath to his full capacity. The duration of Puraka, Kumbhaka and Rechaka must be properly adjusted. Exercise due care and attention. Matters will turn to be successful and easy.

A person must so carefully regulate the Puraka, Kumbhaka and Rechaka that must be absolutely comfortable and perform not only one Pranayama but also the full course or required rounds of Pranayama. Practice makes one perfect. Be steady. Another important factor is that an individual must have efficient control over the lungs at the end of Kumbhaka to enable a person to do the Rechaka smoothly and in proportion with the Puraka.

Suryabheda and Ujjayi produce heat. Sitkari and Sitali are cooling. Bhastrika preserves normal temperature. Suryabheda destroys excess of wind; Ujjayi phlegm; Sitkari and Sitali bile; and Bhastrika all the three. Suryabheda and Ujjayi must be practised during winter. Sitkari and Sitali must be practised in summer. Bhastrika can be practised in all seasons. Those persons whose bodies are hot even in winter can practise Sitali and Sitkari during winter season.

Everyone will undoubtedly get success. Slight errors may crop up in the beginning, it does not matter. Do not unnecessarily be alarmed. Do not give up the practice. One will himself learn how to adjust. Common-sense, instinct, the shrill inner voice of the soul will help the person in the path. Everything will come out smoothly in the end. Start the practice this very second in right earnest and become a real yogi. (Iyengar, 2001)

1.5 SURYANAMASKAR

Surya Namaskar, Salute to the Sun or Sun Salutation, is a practice in modern yoga incorporating a sequence of some twelve gracefully linked asanas. The asana sequence is first recorded in the early 20th century. The basic sequence involved moving from a standing position into Downward and Upward Dog poses and then back to the standing position, but many variations are possible. (Shivesh Shukla, 2010).

1.5.1 Suryanamaskar and Mantras

Suryanamaskar is a form of sun worship and can trace its origin back to the Veda’s. The literal meaning of Suryanamaskar is salutation to the sun. Suryanamaskar consists of 12 different postures and is done along with chanting of mantras in every

posture. Suryanamaskar is traditionally performed on empty stomach at sunrise which is considered the most spiritually favorable time and facing the rising sun.

TABLE I

SURYANAMASKAR AND MANTRAS

S.No.	Pose	Mantra	Meaning
1	Pranamasana (Prayer Pose)	Om Mitraaya Namaha	Who is friendly to all
2	Hasta Uttanasana (Raised pose)	Om Ravaye Namaha	The shining one, the healthy One
3	Hasta Padasana (Hand toFoot pose)	Om Suryaya Namaha	Who is the dispeller of dark and liable for brining activity
4	Ashwa Sanchalanasana (Equestrian pose)	Om Bhaanave Namaha	One who lights, the bright one
5	Dandasana (Stick pose)	Om Khagaya Namaha	Who is all permitting, one who moves over the sky
6	AshtangaNamaskara (Salute with eight parts or points)	Om Pooshne Namaha	Giver of nutrition and Satisfaction
7	Bhujangasana (Cobra pose)	Om Hiranyagarbhaaya Namaha	Who has golden color Intelligence
8	Parvatasana (Mountain pose)	Om Mareechaye Namaha	The giver of light with unlimited number of rays
9	Ashwa Sanchalanasana (Equestrian pose)	Om Aadityaaya Namaha	The son of aditi the cosmic great mother
10	Hasta Padasana (Hand to Foot pose)	Om Savitre Namaha	One who is guilty for life
11	Hastauttanasana (Raised arms pose)	Om Aarkaaya Namaha	Worthy of praise and wonder
12	Tadasana	Om Bhaaskaraya Namaha	Giver of wisdom and cosmic Lighting

It is good to chant the sun salutation mantras with the proper intonations. Learn the correct mantra chanting beside with the video. Comprise these mantras in daily practices of Suryanamaskar and feel a sense of unity with the sun. (Adhavan, 2014).

1.5.2 Health Benefits of Suryanamaskar

The first and last pose of Suryanamaskar, the pranamasana (prayer pose) works on the lower body. It effectively strengthens the legs, ankles, and feet. The pose firms the hips, relieves sciatica, and reduces flat feet. In pranamasana, the hands are folded in namaste position close to the heart. Scientifically, the folding of hands together connects the right and left hemisphere of the brain.

The active inhalation and exhalation process throughout the Sun salutation series keeps the blood oxygenated and lungs ventilated. The optimal flow of fresh blood in the body is a great way to detox the body making it free from toxic elements and carbon dioxide.

When the Surya Namaskar Series is practiced regularly and at a fast pace, it stretches the abdominal muscles assisting you in reducing weight around the stomach area. The asanas tone the abs and strengthen the musculoskeletal system.

The Sun Salutation incorporates diverse yoga asanas that enhance the supply of blood and oxygen to these regions helping you savor a youthful glow and long-healthy mane even during old age.

The performance of yoga postures has a calming effect on the brain. However, the specific poses of Surya Namaskar like downward dog, cobra pose gently stimulate the nerves, reduce anxiety, and fortify the nervous system that promotes positivity.

For centuries, we have bowed and offered prayers to the sun the source of life on the planet. It is believed that an element of the Sun is present in everything we eat, drink, and breathe. Surya Namaskar is a complete workout for the physical system and for internalizing the inner Sun for truly reaping the Sun Salutation benefits.

Surya Namaskar is an ancient discipline of expressing gratitude towards the source of life, the Sun through the practice of 12 different postures. The 12 asanas of the Sun Salutation are designed to synchronize the physical cycle with the solar cycle in order to maintain a level of vibrancy, readiness, receptivity, helping you manifest a body and spirit that work as stepping stones to higher possibilities.

1.5.3 Scientific Reasons of Practicing Sun Salutation

Since time immemorial, sun has been worshipped as God. Life begins with the Sun. It holds great significance religiously. Now, science has proved and recognized the healing powers of the sun and the health benefits of sun salutation. The practice of Surya Namaskar in the direction of the sunrise helps maintain optimal Vitamin D in the body. The deficiency of vitamin D causes a disease known as Rickets. Also, solar plexus located behind the navel in the human body is connected to the Sun. The practice of 12 postures of the sun salutation series enhances the solar plexus which, in turn, increases creative, intuitive, and leadership abilities in the practitioners.

1.5.4 Advantages of Suryanamaskar

Without the Sun, there will be no life on Earth. Surya Namaskar or Sun Salutation is a very ancient technique of paying respect or expressing gratitude to the Sun that is the source of all forms of life on the planet. Now just knowing how to do Surya Namaskar is

not enough. It is also important to understand the science behind this very ancient technique, because a deeper understanding will bring forth the right outlook and approach towards this very sacred and powerful yogic technique.

The advantage of Surya Namaskar are as follows: slow pace helps to make body flexible. Medium pace helps to tone the muscles. Invigorates the heart and will cure and prevent blood preesure, palpitation. Fast pace is excellent cardiovascular workout and also helps in weight loss. Develops the lungs, gives you wind and prevents tuberculosis. Eradicates sexual debility, and the special weakness of men and women. Reduces bowleggedness.Stimulates glandular activity; gives a new vivacity to the glands. Improves knock-knees in walking. Prevents and corrects neurasthenia due to rhythmical breathing. Will increase the height of the body if the positions are correctly performed. Gives you poise, mental as well as physical.Will keep you away from sins, for it is the proud act of wellness and disease.

Will remove kidney troubles. Strengthens the stomach, neck, back, and chest by the mere rolling of the stomach towards the spine, as in some of the positions of Surya Namaskar. Reduces the abnormal prominence of the the Adam’s apple by the forward and backward bending of the nook. Will produce direct mechanical efIect upon the alimenbry canal and will prevent and cure constipation. Is the foundation of healthy and sane life and will be of incalculable benefit to you throughout your life.

Surya Namaskar strengthens the entire digestive system (including stomach, pancreas, intestines, liver, etc.) and cures, and prevents constipation. Invigorates the nervous system (including the brain, spinal cord, lower plexus, and cures brain-fag, forgetfulness, worries and other forms of mental derangement. Though shattered nerves

take a longer time and are more difficult to repair than other cells, our graduated course of Surya Namaskars will slowly but surely restore them to normality. Invigorates the heart and will cure and prevent blood preesure, palpitation. Develops the lungs, gives you wind and prevents tuberculosis. Improves the quality and circulation of the blood. Active circulation of the blood is the first law of health. Stimulates glandular activity; gives a new vivacity to the glands. Owing to the stretching and compressing movements of the throat and neck the thyroid gland is stimulated and any tendency to goiter is obviated. Correct glandular functioning governs health and attractiveness. Improves the color and function of the spleen by enabling it to eradicate toxic impurities through profuse prespiration and to absorb vital energy from the atmosphere. A clear skin glowing with ruddy health end vigor is a winning factor for men and women in business and social life.

Strengthens the neck, shoulders, arms, wrists, fingers, back, stomach, waist, abdomen, intestines, thighs, knees, calves and ankles. Strengthening the back is known to be a simple but efficient remedy for kidney troubles.

It Improves and develops the chest, i. e. keeps it hard, firm and elastic; restores it to normal loveliness. Improves the uterus (womb) and ovaries removes menstrual disorders such all dysmenorrhea and consequent pain and misery. Child-bearing is less painful and more easy. All discomforts from menopause vanish. Will rid women of morning sickness and perverted taste and appetite, peculiar to pregnant women and regarded as inevitable. Increase the quantity and improves the quality or milk in nursing mothers. Proven to halt falling ofd o£ hair, and its tendency to grayness and prevents baldness by increasing nutrition to the hair and scalp, and the bonding of the neck backward and forward, insures good circulation to the bead. Eradicates sexual debility, and the special weakness of men and women.

Reduces redundant fat, especially the fat about the abdomen, hips, thighs, neck and chin. Will remove kidney troubles. Strengthens the stomach, neck, back, and chest by the mere rolling of the stomach towards the spine, as in some of the positions of Surya Namaskar. The positions include Pranamasana, Hasta Uttanasana, Hastapaadasana, Ashwa Sanchalana, parvatasana, Ashtanga Namaskara, Bhujangasana, parvatasana, Ashwa Sanchalana,Uttanasana, Hasta Uttanasana, Pranamasana. Reduces the abnormal prominence of the the Adam's apple by the forward and backward bending of the nook. Destroys the offensive odor of perspiration. Reduces bowleggedness. Improves knock-knees in walking.Prevents and corrects neurasthenia due to rhythmical breathing. Will increase the height of the body if the positions are correctly performed. Will produce direct mechanical efIect upon the alimenbry canal and will prevent and cure constipation. Not merely gives you external form, shapeliness and muscle of the body, but improves and normalizes the function of most of the vital internal organs. Makes you immune from disease by tremendously increasing your disease-resisting power. The practical test of health is that one should never have even ordinary cold or cough, which is regarded even by some medical men as inevitable or as a matter of course. A healthy person never feels that he has any organ or limb.

Then you have the jump on your follow man. Gives you poise, mental as well as physical. Endows the performer with more mental and psychic power and instills a theistic attitude in her or him gradually. It increases the power of mental concentration, optimism and self-confidence. Is the foundation of healthy and sane life and will be of incalculable benefit to you throughout your life. Long, systematic, continuous and daily practice of Surya Namaskars and right diet, will, in addition to vibrant health and radiant

energy, invariably create in you a dislike for all stimulants and sedatives; an aversion to hot things such as capsicum or chilly, pepper, spices and condiments; a lack of relish for fried articles in general; and to top them of, generates in you the inestimable habit of abstemiousness, which will help you to live long. “The instances of longevity,” says Sir W. Arbuthnot Lane, England’s great surgeon, are chiefly among the abstemious.” In fact, you gradually become partial to Satvika diet, as defined in tho Bhagavad Gita, XVII {The kinds of food which increase life, vitality, strength, pleasure or joy of living, cheerfulness and philanthropy, fellow-feeling, are juicy, fatty or substantial to hunger and delicious or heart strengtheners, are dear to me, and are Satvika.). Will keep you away from sins, for it is the proud act of wellness and disease. Will generate in you good thought, optimistic thoughts; will give a charitable and sanguine turn to your disposition and will imbue you with a spirit of self-sacrifice for the good of your community, your country and your king. And will, in short, unlock the door to g1orious Health, Strength, Efficiency and Longevity, which God intended for you. You will thus see that the Namaskars possess the unique feature of co-ordinated actions of all the vital organs, nerves, muscles and other parts of the system, which are stimulated, developed and strengthened simultaneously, a result not achieved by any other single exercise.

1.6 CARDIO VASCULAR ENDURANCE

Cardiovascular endurance is how efficiently your heart, blood vessels, and lungs to supply oxygen rich blood to working muscles during physical activity (aerobic activity like walking, running, cycling or playing a sport) for a prolonged period of time or for more than 90 seconds. Is the most important because it gives you many health and wellness benefits, including a chance for a longer life. It requires a strong heart, healthy lungs, and clear blood vessels to supply your large muscles with oxygen.

Increasing cardiorespiratory endurance improves oxygen uptake in the lungs and heart and can help a person sustain physical activity for longer. Other names for cardiorespiratory endurance include cardiovascular fitness, cardiovascular endurance, and cardiorespiratory fitness.(Kunwar Bipin Pratap Bhushan , 2017)

1.7 VITAL CAPACITY

Vital capacity is the maximum amount of air a person can expel from the lungs after a maximum inhalation. It is equal to the sum of inspiratory reserve volume, tidal volume, and expiratory reserve volume. A person's vital capacity can be measured by a wet or regular spirometer.(Acharya, 2010)

1.7.1 Way to Increase Vital Capacity

A way to increase lung capacity is to improve exercise tolerance. Exercise causes the heart and breathing rates to increase, so the body has enough oxygen and strengthens the heart and lungs. The average person's lung capacity can be improved around 5 percent to 15 percent even with frequent workouts.

1.8 VO_2 MAX. (MAXIMUM OXYGEN CONSUMPTION)

It also known as maximal oxygen uptake, is the measurement of the maximum amount of oxygen a person can utilize during intense exercise. It is a common measurement used to establish the aerobic endurance of an athlete prior to or during the course of training.. (Sivagami et al., 2017)

1.9 LIPID PROFILE

Lipid profile or lipid panel is a panel of blood tests that serves as an initial screening tool for abnormalities in lipids, such as cholesterol and triglycerides.

A complete cholesterol test is also called a lipid panel or lipid profile. Doctor can use it to measure the amount of “good” and “bad” cholesterol and triglycerides, a type of fat, in the blood. Cholesterol is a soft, waxy fat that the body needs to function properly.

1.9.1 Cholesterol

Cholesterol is a type of body fat, or lipid. A serum cholesterol level is a measurement of certain elements in the blood, including the amount of high- and low-density lipoprotein cholesterol in a person's blood.

1.9.2 Serum Cholesterol

Serum Cholesterol levels also show the amount of triglycerides present. If a person have an LDL of 150 mg/dl, HDL of 35 mg/dl, and triglycerides of 180 mg/dl, the serum cholesterol would be 221 mg/dl. That's considered a borderline high level. (Subhash, 1992).

1.9.3 High Density Lipoprotein

HDL stands for high-density lipoproteins. It is sometimes called the "good" cholesterol because it carries cholesterol from other parts of your body back to your liver. It is sometimes called the "bad" cholesterol because a high LDL level leads to a buildup of cholesterol in your arteries. (Anjum Sayyed, 2010)

1.9.4 Low Density Lipoprotein

LDL stands for low-density lipoprotein a type of cholesterol found in the body. LDL is often referred to as bad cholesterol. Doctor may order an LDL test as part of a routine exam to determine the risk for heart disease and decide if any treatment is necessary.

LDL cholesterol levels should be less than 100 mg/dl. Levels of 100 to 129 mg/dL are acceptable for people with no health issues but may be of more concern for those with heart disease or heart disease risk factors. A reading of 130 to 159 mg/dl is borderline high and 160 to 189 mg/dl is high.

When the LDL level is high, it can start to form a plaque-like substance on the walls of the cardiovascular system, blocking the natural flow of blood and leaving at severe risk for heart attack and stroke. A few changes in the diet can reduce cholesterol and improve the heart health. Reduce saturated fats. Saturated fats, found primarily in red meat and full-fat dairy products, raise the total cholesterol. The followings are ways to reduce LDL: Eliminate trans fats, Eat foods rich in omega-3 fatty acids. Increase soluble fiber and add whey protein. (Krzysztof Stec , 2017)

1.9.5 Very Low Density Lipoprotein

VLDL (Bad) Cholesterol. VLDL contains the highest amount of triglycerides. VLDLis considered a type of bad cholesterol, because it helps cholesterol build up on the walls of arteries. Normal VLDL levels are from 2 to 30 mg/dL (0.1 to 1.7 mmol/l). (Acharya et al., 2010)

1.9.6 Triglycerides

Triglycerides are a type of fat (lipid) found in the blood. When we eat, the body converts any calories it doesn't need to use right away into triglycerides. The triglyceridesare stored in the body as fat cells. Later, hormones releasetriglycerides for energy between meals.

Triglycerides are a type of fat found in the blood. But high triglycerides might raise the risk of heart disease and may be a sign of metabolic syndrome. Metabolic

syndrome is the combination of high blood pressure, high blood sugar, too much fat around the waist, low HDL ("good") cholesterol, and high triglycerides. (Baljinder Singh Bal, 2018)

1.10 HAND EYE COORDINATION

Hand Eye Coordination is the coordinated control of eye movement with hand movement and the processiong of visual input to guide reaching and grasping along with the use of proprioception of hand to guide the eye". (Aloke Sen Borman, 2016)

1.11 LEG EYE COORDINATION

Leg Eye coordination is a perceptual-motor skill, that requires the ability of the eyes to perceive and understand objects within our environment in relation to our bodies (known as visual perception); whilst our muscles, joints and body systems move and respond to this information in a controlled and appropriate. (Hart Cady, 2008)

1.12 REACTION TIME

Reaction time is a measure of how quickly an organism can respond to a particular stimulus. Reaction time has been widely studied, as its practical implications may be of great consequence, e.g. a slower than normal reaction time while driving can have grave results. (Bhavanani, 2013)

1.13 STATEMENT OF THE PROBLEM

The purpose of the study was to find out the efficacy of isolated asana, pranayama and suryanamaskar on selected physiological, bio-chemical and psychomotor ability variables of college men.

1.14 SIGNIFICANCE OF THE PROBLEM

1. The ultimate goal of research in physical education is to help physical educators and coaches to train their students, athletes and players based on new concepts to improve their performance.
2. The study would add new knowledge in the area of yoga, pranayama and surya namaskar.
3. The results of the study may be useful to the professional personnel of physical education and sports to introduce asana training, pranayama training and suryanamaskar training to improve general fitness of college students.
4. This investigation may be helpful for the male college students to maintain their fitness by doing these selected training programmes.
5. This study would be helpful to know the importance of fitness for the college men.
6. The findings of the study will be useful to the physical education teachers and coaches for appropriately identifying physical training methods needed to coach as well as the student.
7. The result of this study would be used as various isolated asanas, pranayama and suryanamaskar training in yoga for college men.

1.15 HYPOTHESES

1. It was hypothesized that there may be significant improvement from base line to post treatment on the selected physiological, bio chemical and psychomotor ability variables due to the efficacy of asana training.

2. It was hypothesized that there may be significant improvement from base line to post treatment on the selected physiological, bio chemical and psychomotor ability variables due to the efficacy of pranayama training.
3. It was hypothesized that there may be significant changes from base line to post treatment on the selected physiological, bio chemical and psychomotor ability variables due to the efficacy of suryanamaskar training.
4. It was hypothesized that there may be significant difference among experimental and control groups on the selected physiological, bio chemical and psychomotor ability variables due to the respective experimental trainings.

1.16 DELIMITATIONS

1. This study was restricted to 80 college men students were randomly selected as subjects from Sri Venkateswara University affiliated Colleges namely, Sri Venkateswara University College of Engineering, Tirupathi, SEICOM Degree College, Tirupathi, Chittoor District, Andhra Pradesh, India.
2. This study was restricted the college men students and their ages were ranged from 17 to 21 years
3. The asana, pranayama and suryanamaskar training was conducted on 5 days of every week, except saturday and sunday. The training starts at 5.30 p.m. to 6.30 p.m.
4. This study was restricted to the following physiological variables namely cardio respiratory endurance, vital capacity and VO_2 Max. bio-chemecal variables namely, Serum Cholesterol, High Density Lipoproerin, Low Density Lipoproerin, Very Low Density Lipoproerin and triglycerides and psychomotor variables namely, hand eye coordination and leg eye coordination and reaction time

1.17 LIMITATIONS

1. The socio economic status was not taken into consideration.
2. The effect of uncontrollable factors like heredity and environments factors were also considered as limitation of the study.
3. Certain factors such as life style, rest period, daily routine work and other factors related with the subjects were not taken into consideration.
4. The height and weight of the subjects were not considered.

1.18 DEFINITION OF TERMS

1.18.1 Yoga

Yoga is the union of the individual self with the universal self. The word “yoga” comes from the Sanskrit root yuj which means “to join” to “to yoke”. (Iyengar, 2001)

1.18.2 Asana

“Asana mean to be seated in a position that is firm, but relaxed”. The ability to sit for extended periods as one of the eight limbs of this system, known as ashtanga yoga. (Swamy Prabhavananda, 1996)

1.18.3 Pranayama

Pranayama is a sanskrit word meaning "extension of the prana or breath" or, "extension of the life force". The word is composed of two Sanskrit words,prana, life force, or vital energy, particularly, the breath, and "ayāma", to extend or draw out. (Iyengar, 2006)

1.18.4 Surya Namaskar

Surya Namaskar known as Sun Salutation is a set of 12 dynamic exercises. It is an age-old yogic training which contributes to mental, emotional, physical, and spiritual well-being. The Namaskar is an obeisance to the Sun God or Surya. Surya Namaskar is normally performed early in the morning, at daybreak, or in the evening, when the sun is setting. It is accompanied by a specific breathing pattern and chanting of mantras. (Adhavan, 2014)

1.18.5 Physiology

Human physiology is the science of the mechanical, physical, and biochemical functions of humans, their organs, and the cells of which they are composed. Physiology is closely related to anatomy; physiology is the study of function.

1.18.6 Cardio Respiratory Endurance

Cardiorespiratory endurance refers to the ability of the body to perform prolonged, large muscle, dynamic ecercise at moderate to high levels of intensity. Cardiorespiratory endurance is an important part of overall phyaical fitness. (Scott, 2011)

1.18.7 Vital Capacity

The Volume of gas that can be expelled from lungs from a position of full inspiration, with no limit of inspiration, equal to inspiratiory capacity puls expiratatory reserve vloume. (Vandevoorde J, 2008)

1.18.8 VO_2 Max. (Maximum Oxygen Consumption)

The maximum or optimum rate at which the heart, lungs, and muscles can effectively use oxygen during exercise, used as a way of measuring a person's individual aerobic capacity. (Vishnu D Udhan, 2018)

1.18.9 Bio-Chemecal

Biochemistry, sometimes called biological chemistry, is the study of chemical processes within and relating to living organisms. By controlling information flow through biochemical signaling and the flow of chemical energy through metabolism, biochemical processes give rise to the complexity of life. Including an overview of energy metabolism, some key aspects of skeletal muscle structure and function, and some simple biochemical concepts. It continues by looking at the three macromolecules which provide energy and structure to skeletal muscle - carbohydrates, lipids, and protein. The last section moves beyond biochemistry to examine key aspects of metabolism - the regulation of energy production and storage. Beginning with a chapter on basic principles of regulation of metabolism it continues by exploring how metabolism is influenced during high-intensity, prolonged, and intermittent exercise by intensity, duration, and nutrition. (Donald MacLaren, 2011)

1.18.10 Psychomotor

Psychomotor learning is demonstrated by physical skills such as movement, coordination, manipulation, dexterity, grace, strength, speed—actions which demonstrate the fine or gross motor skills, such as use of precision instruments or tools, and walking.

Psychomotor test are used for determining the precision, coordination, control, dexterity and reaction time for candidates in the hiring process. It not only assesses the mechanical performance of the candidate but also their ability to understand and follow instructions and perform motor responses.

1.18.11 Psychomotor Ability

Psychomotor ability refers to a wide range of actions involving physical movement related to conscious cognitive processing. Psychomotor ability may be measured by accuracy or speed.

Psychomotor ability is a behavioral examples include driving a car, throwing a ball, and playing a musical instrument. In psychomotor learning research, attention is given to the learning of coordinated activity involving the arms, hands, fingers, and feet, while verbal processes are not emphasized. (Sushil S Khemka, 2011)

1.18.12 Hand Eye Coordination

Hand eye coordination is the coordination control of eye movement with hand movement and the processing of visual input to guide reaching and grasping along with the use of propriocepior of the hands. (Konstant in Kougioumtzis, 2004)

1.18.13 Leg Eye Coordination

Ability to use eyes and legs together in such acts manipulatingobjects. It is important in all requireing fine accuracy, such a footbal kicking. (Harold M. Barrow, 2007)

1.18.14 Reaction Time

Reaction, time is defined as the, time interval between applications of a stimulus and elicitation of a response. (Kamble, 2013)

Chapter II

Review of Related Literature

CHAPTER II

REVIEWS OF RELATED LITERATURES

The literature in any field forms the foundation upon which all future works will be built. Many investigators in various fields recognize the importance and need of old literature for health and proper guidance for further research work. It tells which methods were used to collect the needed information (data) and which of statistical techniques or operation was used to analyze it.

A study of relevant literature is an essential step to get a good comprehension of what has been done with regard to the problem under study. Accordingly the researcher has gone through available literatures which are relevant to the present study.

The findings and recommendations made in the old related literature provide theories and ideas of further investigation and explanations contributes to the general guidance to new investigators. Hence the present investigator decided to study the old literature directly or indirectly related to this and has recorded them in the present chapter.

The reviews of related literature a presented in the following topics:

2.1 Reviews of related literature on asana

2.2 Reviews of related literature on pranayama

2.3 Reviews of related literature on suryanamaskar

2.1 REVIEWS OF RELATED LITERATURE ON ASANA

Aloke Sen Borman, (2016) conducted a study on multiple intervention of yogic technique may improve physical fitness. But there was no such study on the effect of

yogic asana alone and its impact on hand eye coordination which is most important component of performance related physical fitness. The aim of this study was to determine the effect of regular practice of yogic asana on hand eye coordination. Total 48 residential male students (12+1 years) were participated in this study. It was randomized into two equal groups as yoga group (n=24) and waitlist control group (n=24). Yoga group was regularly practiced only yogic asana for 1 to 1.5 hour per day, 6 days per week, for 12 weeks with a progressive load method. The hand eye coordination was assessed by measuring ball transferring ability. In the present study all the measurements were done at the baseline (before onset of training) after 6 and 12 weeks of asana training. A repeated measure of ANOVA was used for analyzing the data. Simple percentage also calculated from the mean value to see the quantitative changes of the asana training. After 12 weeks, yoga group showed a significant improvement in coordination (77.59%). Conclusion: Yogic asana alone may elicit a positive improvement in hand eye coordination.

Himashree, et al., (2016) conducted a study on yoga facilitates improvements in health and performance at Karu, Leh, India, at an altitude of 3445 m. Participants fully acclimatized soldiers in the Indian army were randomly selected from those posted to HA regions (i.e, altitudes >3000 m). Intervention the soldiers were divided into two groups of equal size. The first group, namely control group, carried out the routine activities for physical training in the Indian army. The second group, namely the intervention group practiced a comprehensive yoga package, including physical asana, pranayama, and meditation, and did not perform the physical training that the first group did. Both groups were monitored during their activities. Outcome Measures A wide and comprehensive

range of anthropometrical, physiological, biochemical, and psychological parameters were measured: height and weight; body fat percentage (BFP); heart rate (HR); respiratory rate (RR); systolic and diastolic blood pressure (DPB); peripheral saturation of oxygen; end tidal CO2 (Et CO2); chest expansion; pulmonary function; physical work capacity (VO2Max); hematological variables; lipid profile; serum urea; keratinize; liver enzymes; blood glucose; and anxiety scores. Measurements were made at baseline and post intervention. Two-hundred soldiers took part in the study. The yoga group showed a significant improvement in health indices and performance as compared with the control group. They had lower weights, BFPs, RRs, DBPs, and anxiety scores. They also had a significantly higher Et CO2, forced vital capacity, forced expiratory volume in the first second (FEV1), and VO_2 Max. Also, the yoga group showed a significant reduction in serum cholesterol, low-density lipoprotein, triglycerides, and blood urea as compared with their pre yoga levels and with the exercise group. Practice of yoga facilitates improvements in health and performance and is superior to routine training with physical exercises. Comprehensive yogic practices are an effective modality for improving health and performance.

Sovan Maiti et al., (2016) conducted a study on effect of selected yogic exercise on eye-hand coordination of Vidyasagar University sports persons. The present study was selected to investigate the effect of selected yogic exercise on eye-hand coordination of university's male sports persons (Ave. age 21-23 Yrs.) To conduct the study 200 inter collegiate coming under the jurisdiction of Vidyasagar University West Bengal were selected as sample. These selected subjects than divided into two group i.e. experiment and control group with equal number of subjects assigned randomly in each group.

The subjects of experimental group received six months of yoga exercise training program while subjects grouped into control group did not receive such programme. To determine eye- hand coordination of the selected subjects, Mirror Drawing Test was used. Result indicates that six months yogic exercise regime has been instrumental in improving the eye hand coordination of university's male sports persons belonging to experimental group. Therefore it may be concluded that yogic exercises are good medium to improve eye-hand coordination of university's male sports persons.

Mukesh Kumar Mishra et al., (2015) conducted a study on yogic training on physiological variables like resting heart rate and vital capacity. The data was collected through the pre and post test. For the study single group design was used in which the pre test was taken prior to the yogic training and post test was taken after eight weeks of yogic training. For comparing pre and post test means of resting heart rate and vital capacity, descriptive analysis and paired t-test were applied at 0.05 level of significant. The result of the study showed that there was significant difference between pre and post test of resting heart rate and vital capacity. On the basis of the findings it was concluded that the yogic training may be responsible for the improvement of selected physiological variables like resting heart rate and vital capacity.

Caren Lau et al., (2014) conduct a study on the effects of a 12-week hatha yoga intervention on cardio respiratory endurance, muscular strength and endurance, and flexibility in Chinese adults. 173 adults (aged 52.0 ± 7.5 years) were assigned to either the yoga intervention group or the waitlist control group. 19 dropped out from the study. Primary outcomes were changes in cardio respiratory endurance (resting heart rate (HR) and maximal oxygen uptake, muscular strength and endurance (curl-up and push-up tests),

and lower back and hamstring flexibility (the modified back-saver sit-and-reach (MBS) test). Compared to controls, the yoga group achieved significant improvements in, curl-up and push-up tests, and the MBS left and right leg tests (both) in both genders. Significant change was also found for resting HR between groups in women but not in men. Further analysis comparing participants between younger and older subgroups yielded similar findings, except that the older participants in the yoga group failed to improve resting HR or the curl-up test versus control. Adherence (89%) and attendance (94%) were high. No serious adverse events occurred. A 12-week hatha yoga intervention has favorable effects on cardio respiratory endurance, muscular strength and endurance, and flexibility in Chinese adults.

Kaushik Halder and Abhirup Chatterjee, et al., (2012) conducted a study on effect of three months yogic practices on ventilator functions. Sixty (n=60) healthy male volunteers (age range 21–33 years and height of 174.8 ± 3.52 cm) drawn randomly from BSF personnel participated in the study. Participants practiced yoga under supervision of professional yoga instructor, two hours daily five days a week, along with their daily routine activities. Standing height, weight and dynamic lung function tests viz. Forced Vital Capacity (FVC), Forced Expiratory Volume in 1st second (FEV1) and Maximum Voluntary Ventilation (MVV) were measured before and after 3 months of yoga training was calculated before and after the said training. After three months of yogic practice, there was no significant change in body weight with a trend of reduction. MVV increased significantly ($P < 0.01$) while the other parameters viz. FVC, FEV1 and TI did not change significantly. Increase in MVV indicates that yogic practices improve the pulmonary capacity of practitioner which can help in enhancement of ventilator functions.

Samiran et al., (2012) determined the effect of regular practice of yogic asana on health related physical fitness. A total of 48 residential male students (12±1year) participated in this study. It was randomized into two equal groups as yoga group (n=24) and wait list control group (n=24).Yoga group was regularly practice do only yogic asana for1to1.5 hour per day, 6 days per week, for12 weeks with a progressive load method. The health related physical fitness was assessed by measuring strength, muscular endurance, cardiovascular endurance, flexibility and body composition. In the present study all the measurements were done at the baseline (before on set of training) after 6 and 12 weeks of asana training. A repeated measure of ANOVA followed by post hoc analysis was used for analyzing the data. Simple percentage also calculated from them a value to see the quantitative changes of the asana training. After 12 weeks, yoga group showed a significant improvement in right hand grip strength (14.10%), left hand grip strength (16.28%) , muscular endurance (77.59%), cardiovascular endurance (8.61%), flexibility (18.72%) where as lean body mass (7.69%) and body fat percentage (33.63%) decreased significantly. It was concluded that yogic asana alone may elicit a positive improvement in the health related fitness.

Sushil S Khemka, et al., (2011) conducted a study on “correlations were found between the following pairs, the two sustained attention variables, emotional intelligence and general health”, GHQ and tamas; sattva and tamas; and rajas and tamas. The study shows that there were significant changes in all variables ($P< 0.001$) except in sattva. It also confirms that EQ and general health variables correlate significantly with each other and negatively with tamas. EQ and tamas form positive and negative predictors of health respectively. Sattva correlates positively with EQ suggesting that a sattvic

personality indicates better self-control. This suggests that, by improving guna personality, long-term yoga practice may stabilize EQ.

Hart, Cady et al., (2008) conducted a study on effects on motor variability in young adults, the exercise training programs can increase strength and improve sub maximal force control, but the effects of yoga as an alternative form of steadiness training are not well described. The purpose was to explore the effect of a popular type of yoga (Bikram) on strength, steadiness, and balance. Young adults performed yoga training (n = 10, 29 ± 6 years, 24 yoga sessions in 8 weeks) or served as controls (n = 11, 26 ± 7 years). Yoga sessions consisted of 1.5 hours of supervised, standardized postures. Measures before and after training included maximum voluntary contraction (MVC) force of the elbow flexors (EF) and knee extensors (KE), steadiness of isometric EF and KE contractions, steadiness of concentric (CON) and eccentric (ECC) KE contractions, and timed balance. The standard deviation (*SD*) and coefficient of variation (CV, *SD*/mean force) of isometric force and the *SD* of acceleration during CON and ECC contractions were measured. After yoga training, MVC force increased 14% for KE (479 ± 175 to 544 ± 187 N, $p < 0.05$) and was unchanged for the EF muscles (219 ± 85 to 230 ± 72 N, $p > 0.05$). The CV of force was unchanged for EF (1.68 to 1.73%, $p > 0.05$) but was reduced in the KE muscles similarly for yoga and control groups (2.04 to 1.55%, $p < 0.05$). The variability of CON and ECC contractions was unchanged. For the yoga group, improvement in KE steadiness was correlated with pre training steadiness ($r = -0.62$ to -0.84, $p < 0.05$); subjects with the greatest KE force fluctuations before training experienced the greatest reductions with training. Percent change in balance time for individual yoga subjects averaged +228% (19.5 ± 14 to 34.3 ± 18 seconds, $p < 0.05$), with no change in controls. For young adults, a short-term yoga program of this type can

improve balance substantially, produce modest improvements in leg strength, and improve leg muscle control for less-steady subjects.

Harinath, et al., (2004) evaluated effects of hatha yoga and omkar meditation on cardio respiratory performance, psycho logic profile, and melatonin secretion. Thirty healthy men in the age group of 25-35 years volunteered for the study. They were randomly divided in two groups of 15 each. Group 1 subjects served as controls and performed body flexibility exercises for 40 minutes and slow running for 20 minutes during morning hours and played games for 60 minutes during evening hours daily for 3 months. Group 2 subjects practiced selected yogic asanas (postures) for 45 minutes and pranayama for 15 minutes during the morning, whereas during the evening hours these subjects performed preparatory yogic postures for 15 minutes, pranayama for 15 minutes, and meditation for 30 minutes daily, for 3 months. Orthostatic tolerance, heart rate, blood pressure, respiratory rate, dynamic lung function (such as forced vital capacity, forced expiratory volume in one second, forced expiratory volume percentage, peak expiratory flow rate, and maximum voluntary ventilation), and psychological profile were measured before and after 3 months of yogic practices. Serial blood samples were drawn at various time intervals to study effects of these yogic practices and omkar meditation on melatonin levels. Yogic practices for 3 months resulted in an improvement in cardio respiratory performance and psychologic profile. The plasma melatonin also showed an increase after three months of yogic practices. The systolic blood pressure, diastolic blood pressure, mean arterial pressure, and orthostatic tolerance did not show any significant correlation with plasma melatonin. However, the maximum night time melatonin levels in yoga group showed a significant correlation ($r = 0.71$, $p < 0.05$) with well-being score.

2.2 REVIEWS OF RELATED LITERATURE ON PRANAYAMA

Vishnu D Udhan et al., (2018) conducted a study to find out the effect of Yoga practice on Physical Fitness Index (PFI) and Maximum Oxygen Consumption (VO_2 max.) in healthy adults. A pre-post interventional study was conducted on 200 (120 male and 80 female) healthy subjects. An intervention of Yoga (Asanas, Pranayama and Meditation) for six months (one hour per day, six days per week) was given. Weight, Body Mass Index (BMI), Basal Metabolic Rate (BMR), Physical Fitness Index (PFI) and VO_2 max. were determined. PFI and VO_2 max. were determined by using modified Harvard Step Test (HST) and modified Queen's College Step Test (QST), respectively. Data was collected at baseline and after six months of yoga training. Collected result data was analysed by using paired t-test. Yoga practice for six months caused significant reduction in weight and BMI.

Kunwar Bipin Pratap Bhushan et al., (2017) conducted a study to find out the Impact of Bhramari Pranayama on Cardio Respiratory Endurance. Pranayama is an integral part of Asthanga Yoga, which improves our respiratory functions as well as overall health. Game of Cricket is mainly concerned with endurance and stamina of the players. Best performance in the game is very important for each Player. Pranayama promotes good health of an individual and helps to achieve better performance. Total 90 male (clinically healthy) cricket players of district level from Varanasi district were selected as subjects. Further they divided randomly into two groups as experimental (N=45) and control (N=45). The subjects of experimental group practiced Bhramari Pranayama training programme for twelve weeks. Subjects of control group were not advised to do Bhramari Pranayama or any other Yogic practice during the study period.

Cardio Respiratory Endurance was selected as dependent parameter. The collected data were statistically analyzed by using paired t-test. Level of significance considered at $P < 0.05$. The Statistically Significant result was found in Cardio Respiratory Endurance in experimental group. In cricketers having Pitta Prakriti significant change in Cardio Respiratory Endurance were found after practicing Bhramari Pranayam for twelve weeks. Practice of Bhramari Pranayama is effective for improving Cardio Respiratory Endurance.

Sivagami, et al., (2017) conducted a study on effects of Nadisudhi Pranayama on Cardio-Respiratory Parameter. The study was designed to assess the beneficial effects of Nadisudhi pranayama on cardio respiratory parameters. 60 young healthy subjects in the age group of 17-24 years were selected for the study. They received Nadisudhi pranayama training of 6 days a week for 6 weeks. Pulse rate, Blood pressure & Peak expiratory flow rate (PEFR) were recorded before and after 6 weeks of training. Results were analyzed by using paired't' test. There was significant decrease in Pulse rate, Blood pressure and increase in Peak expiratory flow rate after practice of Nadisudhi pranayama. Decrease in Pulse rate, Blood pressure after practice of Nadisudhi pranayama could be due to increase in parasympathetic activity & decrease in sympathetic activity. Improvement in Peak expiratory flow rate could be due to increase in surface area of the alveolar membrane, acclimatization of respiratory centers to high PCO2 & strengthening of the respiratory muscle in Nadisudhi pranayama trained persons. Conclusion: Nadisudhi pranayama is effective in lowering the Pulse rate, Blood pressure & improve the Peak expiratory flow rate. It may be an effective non pharmacological intervention in clinical conditions like bronchial asthma, early bronchitis and hypertension. Pranayama is the breath control practice to control body energies. Nadisudhi means, 'the purification of

the invisible energy channels.' Practice of Nadisudhi pranayama causes feeling of freshness, energy and lightness of body and mind. Regular pranayama practice causes many desirable physical, physiological and psychological changes in an individual.

Palpandi and Radhakrishnan, et al., (2016) found out the effects of asanas and varied pranayama practices on physiological variables among inter collegiate players. To achieve the purpose of the study (N=60) sixty inter collegiate players were randomly selected from three engineering College AIT, KCT and SRE College, Coimbatore and their age ranged between 18 and 25. The subjects were divided into three equal groups. Experimental Group I named as Asanas and varied pranayama (Sithali and Sitkari), Experimental Group II named as Asanas and varied pranayama(Bhastrika and Kapalbhati) practices and Group III acted as control group (CG) pre – test was conducted for all the groups on selected variables and the score was recorded in their respective units as pre – test score. After pre – test the experimental group were treated with their respective training for three day per week for a period of twelve weeks. After completion of twelve weeks of training post – test was conducted on selected variables and the score were records in their respective units as post – test score. The pre and post test scores were analyzed with analysis of Co – variance and Scheffe's post hoc test. In all the cases. 0.5 level of significance was fixed. The results of the study showed that there was a significant difference found among the experimental groups. Asanas and varied pranayama (Bhastrika and Kapalbhati) practices Group is found to be better than other groups. Cardio respiratory endurance, VO2 max and breath hold time. It was concluded Asanas and varied Pranayama (Sithali and Sitkari) and (Bhastrika and Kapalbhati) practices group showed better improvement on pre to post test on Cardio respiratory endurance, VO2 max and Breath hold time. It was concluded that Asanas and varied

Pranayama (Sithali and Sitkari) and (Bhastrika and Kapalbhati) practices group showed better improvement when compared to control group on pre to post test on Cardio respiratory endurance, VO2 max and Breath hold time. The Asanas and varied Pranayama (Bhastrika and Kapalbhati) practices showed better improvement than the Asanas and varied Pranayama (Sithali and Sitkari) practices group on Cardio respiratory endurance, VO_2 Max. and Breath hold time.

Tejaswini, Sonwane, et al., (2016) conduted a study on the effects of yoga and pranayama on human reaction time and certain physiological parameters in normal and hypertensive subjects. Yoga influences body as well as controls the stress in the individual. An index of the processing ability of central nervous system and a simple means of determining sensory-motor performance is referred to as reaction time (RT). It has been proclaimed that human performance including central neural processing is improved by yoga training. It improves cardio respiratory performance, balances autonomic nervous system, decreases pulse, respiratory rate, systolic and diastolic blood pressure. To show the effects of yoga and pranayam on auditory and visual RT and on certain physiological parameters such as weight, body mass index, pulse rate, respiratory rate, systolic blood pressure, and diastolic blood pressure in normal and hypertensive subjects. This comparative type of study included 70 normal and 70 hypertensive subjects. It was carried on subjects between 30 and 60 years of age. Auditory reaction time (ART) and visual reaction time (VRT) were studied in subjects with “Response Analyzer” reaction time apparatus. The physiological parameters such as weight, body mass index, pulse rate, respiratory rate, systolic blood pressure, and diastolic blood pressure were measured. Parameters were measured in two sittings; on admission to yoga center and after 3 months. Statistical

software STATA Version 10.0 was used for statistical analysis. It was found that changes in the RT and physiological parameters were significant in hypertensive subjects when compared with normal individuals. Yoga is a helpful intervention in hypertensive subjects. Yoga and pranayama are more beneficial to hypertensive subjects. RT is an index of cortical arousal, and a decrease in it indicates an improved sensory-motor performance and an enhanced processing ability of the central nervous system.

Karthik et al., (2014) conducted a study on pranayama improved lung functions in numerous studies. Yoga involves isometric contraction and improves skeletal muscle strength. Yoga training improves the strength of expiratory as well as inspiratory muscles. The present study is planned to find the effect of pranayama on pulmonary functions in medical students. This study is conducted on 50 students doing lst year M.B.B.S. Consent form has been taken from them. They have been given yoga training 30 min daily for 2 months under the guidance of a trained yoga instructor. Vital capacity (VC), Tidal volume (TV), Expiratory Reserve volume (ERV), Breath holding time (BHT), 40 mm endurance, Peak expiratory flow rate (PEFR) are measured before & after yoga training. VC has increased from 2972 ± 213.151 to 3372 ± 528.7722. TV has increased from 496 ± 84.06347 to 588 ± 150.8863. ERV also shows increase in values from 888 ± 183.303 to 1096 ± 386.7385. BHT also shows increase in values from 33 ± 5.773503 to 58.6 ± 12.78019. 40 mm endurance also shows increase in values from 30.8 ± 5.139715 to 53.52 ± 15.68736. PEFR also shows increase in value from 388.8 ± 15.36229 to 425.2 ± 38.74274. There is a statistically significant increase in all the above mentioned pulmonary functions following yoga training. Yoga practice can be advocated

to improve pulmonary functions in healthy individuals and hence to prevent respiratory diseases in future.

Shyam Karthik et al., (2014) conducted a study on effect of pranayama and suryanamaskar on pulmonary functions in Medical Students. Pranayama improved lung functions in numerous studies. Yoga involves isometric contraction and improves skeletal muscle strength. Yoga training improves the strength of expiratory as well as inspiratory muscles. The present study is planned to find the effect of pranayama on pulmonary functions in medical students .This study is conducted on 50 students doing lst year M.B.B.S. Consent form has been taken from them. They have been given yoga training 30 min daily for 2 month under the guidance of a trained yoga instructor. Vital capacity (VC), Tidal volume (TV), Expiratory Reserve volume (ERV), Breath holding time (BHT), 40 mm endurance, Peak expiratory flow rate (PEFR) are measured before & after yoga training.VC has increased from 2972 ± 213.151 to 3372 ± 528.7722. TV has increased from 496 ± 84.06347 to 588 ± 150.8863. ERV also shows increase in values from 888 ± 183.303 to 1096 ± 386.7385. BHT also shows increase in values from 33 ± 5.773503 to 58.6 ± 12.78019. 40 mm endurance also shows increase in values from 30.8 ± 5.139715 to 53.52 ± 15.68736. PEFR also shows increase in value from 388.8 ± 15.36229 to 425.2 ± 38.74274.There is a statistically significant increase in all the above mentioned pulmonary functions following yoga training. Yoga practice can be advocated to improve pulmonary functions in healthy individuals and hence to prevent respiratory diseases in future.

Keerthi Shravya and Bandi Hari Krishna, et al., (2013) conducted a study on effects of at least a short term practice extended over a period of a few days to weeks of

pranayama (alternate nostril breathing) rather than acute effects of unilateral right nostril breathing (suryanadi pranayama). Keeping this in mind the present study was designed to test the hypothesis that 10 min. of right nostril breathing have any immediate effect on ventilatory volumes and capacities in healthy volunteers. Forced vital capacity (FVC), Forced expiratory volume in the first second (FEV1), Forced expiratory volume percent (FEV1/FVC%), Peak expiratory flow rate (PEFR), Forced expiratory flow 25–75% (FEF25–75%), Maximum voluntary ventilation (MVV), Slow vital capacity (SVC), Expiratory reserve volume (ERV), inspiratory reserve volume (IRV) and Tidal volume (TV) were recorded before and after Surya Nadi Pranayama. There was a significant increase in FVC ($p<0.0001$), FEV1 ($p<0.0007$), PEFR ($p<0.0001$), FEF25–75% ($p<0.0001$), MVV ($p<0.0001$), SVC ($p<0.0001$), ERV (0.0006), IRV ($p<0.0001$) and TV (0.0055) after suryanadi pranayama. The immediate effect of suryanadi pranayama practice showed alleviation of ventilatory capacities and volumes. Any practice that increases PEFR and FEF25–75% is expected to retard the development of COPD's. The increase in PEFR, vital capacities and flow rates by suryanadi pranayama practice obviously offers an increment in respiratory efficiency and it can be advocated to the patients of early bronchitis and as a preventive measure for COPD.

Pradnya Waghmare, et al., (2013) conducted a study on yoga is the science practiced in India since ancient times. It is derived from Sanskrit word Yuj means to bind together. Pranayama, a stage of yoga practice, is an ancient science which makes use of voluntary regulation of breathing and calm the mind. The present study was carried out in 60 healthy first year M.B.B.S. students (40 males & 20 females). These students were given pranayama practice for one hour daily – 6 days in a week for two months.

The subjects were assessed for various cardio respiratory parameters like respiratory rate (RR), FVC, FEV1 PEFR, MVV, pulse rate (PR), blood pressure before and after pranayama practice. Statistical analysis was done by paired T test. There was significant decrease in RR while FVC, FEV1 PEFR, MVV were significantly increased in subjects after the practice of pranayama. There was highly significant increase in 40 mmHg endurance time and significant decrease in pulse rate.

Acharya, et al., (2010) conducted a study on Pranayama (Voluntary Regulated Breathing) and Yogasana (Yoga Postures) that range from very dynamic, active movements that go from one posture to another (and result in a thorough aerobic workout) to more slow-paced practices that hold postures for several minutes and form an intense strength training and balanced workout. Twenty male junior footballers younger than 15 years of age, beloning to the Mohun Bagan Athletic Club, Kolkata, were selected for the study at Haridwar. They had to play in a Football Cup organized in UK and they were here to practice yoga sequences taught by Swami Ramdevji. They were of age 14.65±0.58 years and none of them had a history of lipid metabolism disorders. All the footballers were healthy with no history of smoking or alcohol consumption. The scope and objectives of the present study were explained to the subjects and their written consent was obtained for participation in the study. The institutional ethical committee had approved the study protocol and design. The subjects were asked to follow their routine diet and exercise pattern during the period of study. None of the subjects were exposed to yogic practices before this yoga training session. There was a significant reduction in the levels of serum cholesterol, Low-density lipoprotein (LDL) cholesterol, serum triglycerides, and very-low-density lipoprotein (VLDL)-cholesterol at the end of

the yoga session. The results indicated that the fasting blood sugar (FBS) level was positively elevated in junior footballers. This demonstrated that Pranayama and Yogasana were helpful in regulating sugar level also. The present study demonstrates the efficacy of Pranayama and Yogasana sequences on blood lipid profiles in normal healthy footballers.

Bhimani et al., (2011) conducted a study on effect of pranayama on stress and cardiovascular autonomic function the stress either physical or mental, leads to cardiovascular morbidity. Newly admitted medical students are likely to be exposed to various stresses like change of environment, demanding medical education and different teaching protocol in a medical college. Pranayama is known since ancient times to relieve stress and stabilize autonomic function of the body. Therefore it was decided to study effect of pranayama on stress and cardiovascular autonomic function. The subjects were first M.B.B.S students and the sample size was 59 consisting of 27 males and 32 females. The group of students thus selected was briefed about the study. After the orientation session, informed written consent was taken, stress questionnaire was put and the autonomic function tests were done. This was followed by practice of pranayama for 2 months, 1 hour/day for 5 days/week and again stress questionnaire was put and the autonomic function tests were performed on the study group. The above tests were done before and after the practice of pranayama. The results obtained were analyzed using SPSS software. The stress level has reduced after 2 months of practicing various pranayama as evident by decrease in total stress score which is highly significant. VLF and LF in and have reduced significantly after practice of pranayama signifying reduction in sympathetic drive to heart. HF in and has increased significantly after practice of pranayama for 2 months showing the increase in parasympathetic output to

the heart. LF/ HF ratio reduced significantly after 2 months of practice of pranayama indicating a better balance tilting toward parasympathetic control.

Sukhdev Singh et al., (2011) conducted a study to assess the effects of a 6-week nadi-shodhana pranayama training on cardiopulmonary parameters. A group of 30 male healthy subjects were selected from department of physical education (T), Guru Nanak Dev University, Amritsar (Punjab, India), aged 18 – 24 years, volunteered to participate in the study. Subjects were assigned into two groups: A (experimental: N-15) and B (control: N-15). The subjects from Group A (experimental: N-15) were subjected to a 6-week nadishodhana pranayama training programme. This lasted 6 weeks and consisted of daily sessions, lasting 30 min. Heart rate was measured by counting radial pulse for a minute. Vital capacity was measured by spirometer. Both systolic and diastolic blood pressures were measured with the auscultatory method by using sphygmomanometer and stethoscope. Results showed that the vital capacity significantly improved.

Baljinder Singh Bal et al., (2010) conducted a study on the vital capacity and maximal ventilator to determine the effects of AnulomVilom and Bhastrika Pranayama on Vital Capacity and Maximal Ventilatory Volume, thirty (N = 30) randomly selected male students aged 18 - 26 years volunteered to participate in the study from D.A.V. Institute of Engineering and Technology, Jalandhar (Punjab), India. They were randomly assigned into two groups: A (experimental) and B (control). The subjects were subjected to the eight week pranayama training programme that includes “Anulom Vilom Pranayam” and “Bhastrika Pranayam”. The between-group differences were assessed using the Student’s t-test for dependent data. The level of $p \leq 0.05$ was considered significant. The vital capacity and maximal ventilatory volume significantly improved in group A compared

with the control one. Pranayama training programme may be recommended to improve vital capacity and maximal ventilatory volume.

Vandevoorde, et al., (2008) conducted a study to derive guidelines that identify patients for whom spirometry can reliably predict a reduced total lung capacity (TLC). A total of 12,693 lung function tests were analysed on Caucasian subjects, aged 18-70 yrs. Restriction was defined as a reduced TLC. Lower limits of normal (LLN) for TLC were obtained from the European Respiratory Society recommended reference equations. Reference equations from the National Health and Nutrition Examination Survey III were used for forced vital capacity (FVC) and forced expiratory volume in six seconds (FEV(6)). The performance of FVC and FEV (6) to predict the presence of restriction was studied as follows: 1) using two-by-two (2x2) tables; and 2) by logistic regression analysis. Both analyses were performed in obstructive (defined as forced expiratory volume in one second (FEV (1))/FVC or FEV (1)/FEV(6) <LLN) and no obstructive subgroups, and separately for males and females. The 2x2 tables showed generally low positive and high negative predictive values for FVC or FEV(6) below their LLN in predicting a reduced TLC. Logistic regression analysis showed that in no obstructive subjects, restriction can be positively predicted if FVC or FEV(6) is <55% predicted (males) or <40% pred (females). Restriction can be ruled out if FVC or FEV in six seconds is >100% pred (males) or >85% pred (females). In obstructive patients, spirometry cannot reliably diagnose a concomitant restrictive defect, but it can rule out restriction for patients with forced vital capacity or forced expiratory volume in six seconds >85% pred (males) or >70% pred (females).

Madanmohan, et al., (2005) conducted a study on the effect of short term (three weeks) training in savitri (slow breathing) and bhastrika (fast breathing) pranayams on respiratory pressures and endurance, reaction time, blood pressure, heart rate, rate-pressure product and double product. Thirty student volunteers were divided into two groups of fifteen each. Group I was given training in savitripranayam that involves slow, rhythmic, and deep breathing. Group II was given training in bhastrikapranayam, which is bellows-type rapid and deep breathing. Parameters were measured before and after three week training period. Savitripranayam produced a significant increase in respiratory pressures and respiratory endurance. In both the groups, there was an appreciable but statistically insignificant shortening of reaction time. Heart rate, rate pressure product and double product decreased in savitripranayam group but increased significantly in bhastrika group. It is concluded that different types of pranayams produce different physiological responses in normal young volunteers.

Subbalakshmi et al., (2005) immediate effect of ‘nadi -shodhana pranayama’ on some selected parameters of cardiovascular, pulmonary, and higher functions of brain Practice of pranayama has been known to modulate cardiac autonomic status with an improvement in cardio-respiratory functions. Keeping this in view, the present study is designed to determine whether Nadi-shodana pranayama practice for 20 minutes has any immediate effect on heart rate, systolic and diastolic blood pressure, peak expiratory flow rate, and simple problem solving ability. Ten normal healthy subjects of first year physiotherapy course volunteered for this study. They were aged between 17-20 years. Among them, five were females and five were males. They did not have any previous training in Pranayama. They were highly motivated to participate in this study program.

Study procedures were done separately for each subject at the same time of the day between 4-5 pm. All the selected physiological parameters were measured before and after performing 'Nadi-shodhana Pranayama'. Two sets of controls were done in the matched subjects by allowing them to relax in a couch or close their eyes with quiet breathing for 20 minutes. Following nadi-shodhana pranayama of 20 minutes, a significant decline in basal heart rate ($P<0.01$) and the time taken for simple problem solving was significantly less following pranayama practice ($P<0.0001$). In contrast, both control subjects did not show any significant change in respiratory and cardiovascular parameters with 20 minutes. The present study suggests that the 'Nadi-shodhana Pranayama' rapidly alters cardiopulmonary responses and improves simple problem solving. Further studies on a larger sample size need to illustrate the underlying mechanisms involved in this alteration.

2.3 REVIEWS OF RELATED LITERATURE ON SURYANAMASKAR

Krzysztof Stec et al., (2017) conducted a study on effects of dynamic suryanamaskar practice on the serum lipid profile of Indian students. Reducing lipid levels in blood plasma is one of the ways of preventing cardiovascular disease. 105 randomly selected Indian male students aged 17.15±1.42 years participated in the study. The subjects were divided into 4 groups, according to the Solomon Four Group Design. Groups I (n=26) and III (n=27) performed 6 sessions of training of DSN per week for 12 weeks, while groups II (n=25) and IV (n=27) acted as control groups of untrained subjects. Plasma samples from all subjects were analyzed for the following factors: total cholesterol (T-C), triglycerides (TGs), very low-density lipoprotein cholesterol (VLDL-C), low-density lipoprotein cholesterol (LDL-C), and high-density

lipoprotein cholesterol (HDL-C). In Groups I and II blood samples were taken twice, once before the 12 week training period (Trial-1) and once after it (Trial-2). In Groups III and IV a blood sample was taken once only, that is after the 12 week training period for Groups I and II (Trial-2). Concentrations of all plasma lipids between Groups I and II were significantly different and the levels of T-C ($p<0.001$), TGs ($p<0.001$), VLDL-C ($p<0.001$), and LDL-C ($p<0.001$) had decreased while the level of HDL-C ($p<0.05$) had increased. Also it was shown that the levels of T-C ($p<0.001$), TGs ($p<0.01$), VLDL-C ($p<0.01$), and LDL-C ($p<0.001$) had decreased and that the level of HDL-C ($p<0.05$) had increased within Group I after training, but the levels of all these variables in Group II were unchanged after the 12 week period of time (Trial-1 vs. Trial-2). In Group III compared to Group IV, measured in Trial-2, levels of T-C ($p<0.05$), TGs ($p<0.001$), VLDL-C ($p<0.001$), and LDL-C ($p<0.05$) were lower while HDL-C was higher ($p<0.001$). Intensive DSN training is an effective means of improving the plasma lipid profile. Such training, which can be practiced under almost any conditions, does not cause any negative health effects measurable in the plasma lipid profile.

Biswajit Sinha et al., (2014) conducted a study on effect of 11 months of yoga training on cardio respiratory responses during the actual practice of Surya Namaskar a popular traditional Indian yogic practice, includes practicing 12 physical postures with alternate forward and backward bending movement of the body along with deep breathing maneuvers. The practice of SN has become popular among yoga practitioners and other fitness conscious people. The long term effect of practicing SN and other yogic practices on cardio respiratory responses during SN are lacking. The present study was conducted to study the effect of yogic training on various cardio respiratory responses

during the SN practice in yoga trainees after a time interval of 3, 6, and 11 months. The present study was conducted on 9 healthy male Army soldiers who underwent training in various yoga postures including SN, meditation, and pranayama for 1 h daily for 11 months. First, second, and third phase of the study was conducted in the laboratory after completion of 3, 6, and 11 months of the yoga training. The participants performed SN along with other yogic practices in the laboratory as per their daily practice schedule. The cardio respiratory responses of the volunteers were recorded during actual practice of SN. One-way repeated measure ANOVA followed by Tukey HSD. Oxygen consumption and heart rate during actual practice of SN was 0.794 ± 0.252, 0.738 ± 0.229, and 0.560 ± 0.165 L/min and 92.1 ± 11.6, 97.9 ± 7.3 and 87.4 ± 9.2 beats/min respectively at 1st , 2nd , and 3rd phase of yoga training. Minute ventilation and tidal volume also reduced from 19.9 ± 4.65 to 17.8 ± 4.41 L/min and 1.091 ± 0.021 to 0.952 L/breath from 1st phase to 3rd phase of yoga training. However, respiratory parameters like breathing rate did not show any reduction across the three phases. The results of the present study indicated that yogic training caused conditioning of cardio respiratory parameters except, which did not reduce across three phases of training.

Bhavanani et al., (2013) conducted a study on immediate effects of suryanamaskar on reaction time and heart rate in female volunteers. Suryanamaskar (SN), a yogic technique is composed of dynamic muscular movements synchronized with deep rhythmic breathing. As it may have influence on CNS, this study planned to investigate immediate effects of SN on reaction time (RT) and heart rate (HR). 21 female volunteers attending yoga classes were recruited for study group and 19 female volunteers not participating in yoga were recruited as external-controls. HR, auditory reaction time (ART) and visual

reaction time (VRT) were recorded before and after three rounds of SN in study group as well as 5 minutes of quiet sitting in both groups. Performance of SN produced immediate decrease in both VRT and ART ($P < 0.001$). This was significant when compared to self-control period ($P < 0.001$) and compared to external-control group, it decreased significantly in ART ($p = 0.02$). This was pronounced when delta% was compared between groups ($P < 0.001$). HR increased significantly following SN compared with both self-control ($p = 0.025$) and external-control group ($p = 0.032$). Faster reactivity may be due to intermediate level of arousal by conscious synchronization of dynamic movements with breathing. Rise in HR is attributed to sympathetic arousal and muscular exertion. We suggest that SN may be used as an effective training means to improve neuro-muscular abilities.

Sinha Biswajit, et al., (2013) conducted a study on suryanamaskar (SN) a popular tradition Indian yogic practice called ‘Sun salutation’ contains twelve physical postures and backward and forward bending postures. The practice of twelve postures in sequence makes one round of its practice. Many people practice it as part of their daily physical fitness program. No study is available to compare cardio respiratory reactions of suryanamaskar with bicycle exercise (BE). Hence 20 healthy yoga trainers practicing various yogic practices including suryanamaskar since last 7-8 years were taken for study. They performed suryanamaskar in the laboratory according to their normal daily practice routine. The subject also completed incremental load bicycle exercise test till exhaustion on their second visit for measuring their VO2 max. suryanamaskar and BE were related at three similar exercise intensity levels in terms of % of VO2 max. The exercise intensities were light (10-20% VO2 max), moderate (21-40% VO2 max)

and high intensities (41-50% VO2 Max). Heart rate at high work intensity was significantly higher in bicycle exercise than suryanamaskar (P<.001). Ventilation and carbon dioxide output were significantly higher in bicycle exercise than suryanamaskar at high exercise intensity (P<0.001). Whole, cardio respiratory stress is less in suryanamaskar than bicycle exercise.

Anjum Sayyed et al., (2010) conducted a study on Lipid Profile and Pulmonary Functions in Subjects Participated in Sudarshan Kriya Yoga, We intended to study the effect of Sudarshan Kriya Yoga, a novel breathing technique conceived by the world renowned spiritual leader and founder of The Art of Living Foundation Sri Sri Ravishankar. Millions of followers all over the world are practicing and reporting positive well being and better health. To see the effect of Sudarshan Kriya Yoga on Lipid Profile, Pulmonary Function and Hemoglobin concentration, we conducted a workshop of 8 days consisting of 150 participants. Out of which 55 were included in the study group. Our results show that after practicing Sudarshan Kriya, there is decrease in Total Cholesterol, LDL-Cholesterol along with significant increase in HDL Cholesterol. There are significant changes in Pulmonary Function, but statistically non-significant changes in Hematological parameters. From the observation Sudarshan Kriya Yoga may play vital role in reducing Total Cholesterol (P<0.001) and significantly increasing HDL Cholesterol (P<0.001). Spirometric Pulmonary Function Tests studied were Forced Vital Capacity, Forced Expiratory Volume in first second, Peak Expiratory Flow Rate and Maximum Voluntary Ventilation. The results showed improvement in all Pulmonary Function parameters in all subjects as compared to before practicing Sudarshan Kriya Yoga. Thus Sudarshan Kriya Yoga may have therapeutic implication in the adjunctive (non pharmacological)

management of cardiovascular diseases and respiratory diseases. The present study confirmed the positive effect of Sudarshan Kriya Yoga on Lipid Profile and Pulmonary Function over period of 8 days.

Shenbagavalli et al., (2010) conducted a study to find out the effect of specific yogic exercises programme and combination of specific yogic exercises with autogenic training programme on selected physiological variables such as pulse rate, vital capacity, percent body fat, psychological variables such as job anxiety, occupational stress and biochemical variables such as high density lipoprotein, low density lipoprotein and fasting blood sugar of the college men students. Sixty Men students in the age group of 20 to 30 years from the Alagappa University were randomly selected and served as the subjects for the purpose of this study. The study was formulated as a random group design consisting of specific yogic exercises and combination of specific yogic exercise with autogenic training groups. The subjects (N=60) were at random divided into three equal groups. Experimental group I - was administered specific yogic exercise group, Experimental group II- underwent combination of specific yogic exercises with autogenic training group and control group. All the groups were subjected to pre-test prior to the experimental treatment. The experimental groups participated in their respective duration of 12 weeks, six days in a week throughout the study. Analysis of Co-variance (ANACOVA) was applied to determine the significance of mean difference between the three groups. When F-ratio was found to be significant, the Scheffe‟s Post Hoc test was applied to test the significance of pairs of the adjusted final group means. Practice of the combination of specific yogic exercises with autogenic training and specific yogic exercises programme is significantly effective in promoting desirable changes in the dependent variables. Practice of the combination of specific yogic exercises with

autogenic training programme is significantly effective than the specific yogic exercises programme and control group in promoting desirable changes in selected physiological variables such as pulse rate, vital capacity, percent body fat, psychological variables such as job anxiety, occupational stress and biochemical variables such as high density lipoprotin, low density lipoprotein and fasting blood sugar among the college men students. Practice of the specific yogic exercises programme is significantly effective than the control group in promoting desirable changes in selected physiological variables such as vital capacity, percent body fat, psychological variables such as job anxiety, occupational stress and biochemical variables such as high density lipoprotein, low density lipoprotein, fasting blood sugar among the college men students.

Shenbagavalli et al., (2010) conducted the effect of specific yogic exercise and combination of specific exercise with autogenic training programme and physiological variables such as pulse rate and vital capacity, percent body fat, psychological variables such as job anxiety, occupational stress and biochemical variables such as HDL, LDL and fasting blood sugar of the college male students. 60 male subjects were selected the age of the subject were between 20 to 30 years old from the Alagappa University and they were randomly selected and assessed as the subjects for the purpose of this study and random group continuously specific yogic exercise and combination of specific yogis exercise and autogenic training group. The 60 subjects were divided into 3 groups those are experimental group I directed by specific yogic exercise and experimental group II consist of specific yogic exercise and with autogenic group and control group these groups were subjected to pre and post test prior to the experimental treatment. The experimental groups contributed in their respective duration of 12 weeks, six days in a week throughout the study. Analysis of covariance (ANCOVA) was insisted to

conclude the significant of mean difference between the three groups. When F ratio was found to be significant the Scheffe's post hoc test was applied to test the importance of pairs of the adjusted final group means. Practice of the combination of particular yogic exercises with auto genic training and particular yogic exercises programme is relevantly effective in promoting required changes in the dependent variables.

Pratima Bhutkar, et al., (2008) conducted a study on effect of suryanamaskar practice on cardio-respiratory fitness parameters: a pilot study, In recent times, medical fraternity is attracted towards yoga. Suryanamaskar is a part of yogic practices and is believed to be an all-round exercise. The present study tested efficacy of regular practice of 'suryanamaskar' in improving the cardio-respiratory fitness. The present study was conducted on 78 subjects, (48 males and 30 females). It was observed that 6 months of suryanamaskar practice decreases resting pulse rate and blood pressure. At the same time it increases cardio-respiratory efficiency and respiratory capacity as evaluated by bicycle ergometry and various lung functions tests, in both male and female subjects. From this study we conclude that suryanamaskar practice can be advocated to improve cardio-respiratory efficiency for patients as well as healthy individuals.

Sinha, et al., (2002) conducted a study on "energy cost and cardio respiratory changes during the practice of suryanamaskar". The present study was undertaken to observe critically the energy cost and different cardio respiratory changes during the practice of SN twenty one male volunteers from the Indian Army practiced selected yogic exercises for six days in a week for three months duration. The Yogic practice schedule consisted of hatha yogic asanas (28min), pranayama (10.5 min) and Meditation (5min). In the yogic practice schedule 1st they practiced Kapala Bhathi (breathing man)

for 2 min then yoga mudra (yogic postural exercise) for 2 min, after that they took rest until oxygen consumption and heart rate (HR) came to resting value. Sub sequent l subjects performed SN for 3 min 40 second so nan average. After three month soft raining at the beginning of the fourth month subject performed entire Yogic practice schedule in the laboratory as they practiced during their training session and experiments were carried out. Their pulmonary ventilation, carbon dioxide output, Oxygen consumption, HR and other cardio respiratory parameters were measured during the actual practice of SN Oxygen consumption was highest in the eighth posture (1.22 ± 0.0731 min 1) and lowest in the first posture (0.35 ± 0.021 min –1). Total energy cost throughout the practice of SN was 13.91 k.cal. and at an average of 3.79 k.cal/min. During its practice highest HR was 101±13.5 b.p.m. As an aerobic exercise SN seemed to be ideal as it involves both static stretching and slow dynamic component of exercise with optimal stress on the cardio respiratory system.

Subhash Dadhe et al., (1992) conducted a study on the effect of suryanamaskar on cholesterol level The purpose of the Study was to analyze the effect of suryanamaskar on cholesterol level including Total Cholesterol, Triglyceride, Low Density Lipoproteins, VLDL and High Density Lipoproteins of college students. To conduct this study, 60 students were examined and declared 50 of them were medically fit for this study. They were divided randomly in to two groups as one control and one experimental group, out of which group I (N-25) underwent suryanamaskar activity and group II (N-25) re-kept as control group (N-25). Pre test was conducted for both the groups on Total Cholesterol, Triglyceride, Low Density Lipoproteins, VLDL and High Density Lipoproteins. The experimental group participated in their respective suryanamaskar

exercise for a period of six weeks. Post test were conducted on the above mentioned dependent variables after six weeks of the training period. Blood sample was collected from individual's ear lobe in the morning with empty stomach to check the value of the individual Total Cholesterol, Triglyceride, Low Density Lipoproteins, VLDL and High Density Lipoproteins in pre and post training session. The blood sample was analyzed in the biochemistry lab in Nagpur. Data was analyzed using SPSS. The 't' test statistical techniques was used to find out the effect of suryanamaskar on cholesterol level including Total Cholesterol, Triglyceride, Low Density Lipoproteins, VLDL and High Density Lipoproteins. A significant level of $P<0.05$ was considered significant different. The results of the study indicate that the daily suryanamaskar activity increases higher level of HDL in blood in experimental group than the control group It also clearly indicate that there is a significant difference between experimental group and control group scores on Low Density Lipoproteins and High Density Lipoproteins.

2.4 SUMMARY

The reviews of related literature facilitated the investigator to select relevant topic and variables. Further the literature support the investigator to setting the asana training, pranayama training and suryanamaskar training leading to the problems. Further the literature collected in the study was helped the research scholar to have understandings the similar areas. The reviews of literature helped the investigator to spot out relevant topics and variables. This helped the investigator to frame the suitable hypothesis leading to the problems. The reviews were presented under three sections such as reviews of related literature on asana, pranayama and suryanamaskar.

The researcher has given 10 literatures related to asana training on the selected dependent variables, 16 literatures related to pranayama training on the selected dependent variables and 10 literatures related to suryanamaskar on the selected variables. The researcher has presented the reviews in the related subjects by depending upon the highly authentic sources. Each review has been written in details in relation to this study. Finally the research puts to an end to this chapter after giving all relevant details to each reviews of this chapter.

Based on the experience gained through reviews of the studies, the investigator formulated suitable methodology to be followed in this research, which is presented in chapter III.

Chapter III

Methodology

CHAPTER III

METHODOLOGY

In this chapter the selection of subjects, selection of variables, experimental design, pilot study, criterion measures, reliability of data, reliability of the instruments, tester's reliability, subject reliability, specific training programme, specific training schedule, administration of test, collection of data and the statistical techniques used have been explained.

3.1 SELECTION OF SUBJECTS

The subjects were selected from Sri Venkateswara University affiliated Colleges namely, Sri Venkateswara University College, Tirupathi,, Sri Venkateswara University College of Engineering, Tirupathi and SEICOM Degree College, Tirupathi, Chittoor District, Andhra Pradesh, India. Their age group was ranged from 17 to 21 years. Pre test was administered to a total of 80 college men. To achieve the purpose of the study the selected subjects were randomly divided into four equal groups consisting of twenty each. No attempt was made to equate the groups. Experimental group I was considered as asana training group (ATG), experimental group II was considered as pranayama training group (PTG), experimental group III was considered as suryanamaskar training group (STG) and group IV acted as Control Group (CG) for a period of 12 weeks.

3.2 SELECTION OF VARIBLES

The research scholar reviewed the available scientific literature pertaining to the problem from books, journals, magazines, websites, and research papers with the consideration

of the feasibility, the following physiological, bio-chemical and psychomotor ability variables were selected as most suitable variables for the purpose of the study.

INDEPENDENT VARIABLES

- Asana, Pranayama and Suryanamaskar trainings

DEPENDENT VARIABLES

Physiological Variables

- Cardio Respiratory Endurance
- Vital Capacity
- VO_2 Max. (Maximum Oxygen Consumption)

Bio-Chemical Variables

- Serum Cholesterol
- High Density Lipoprotein
- Low Density Lipoprotein
- Very Low Density Lipoprotein
- Triglycerides

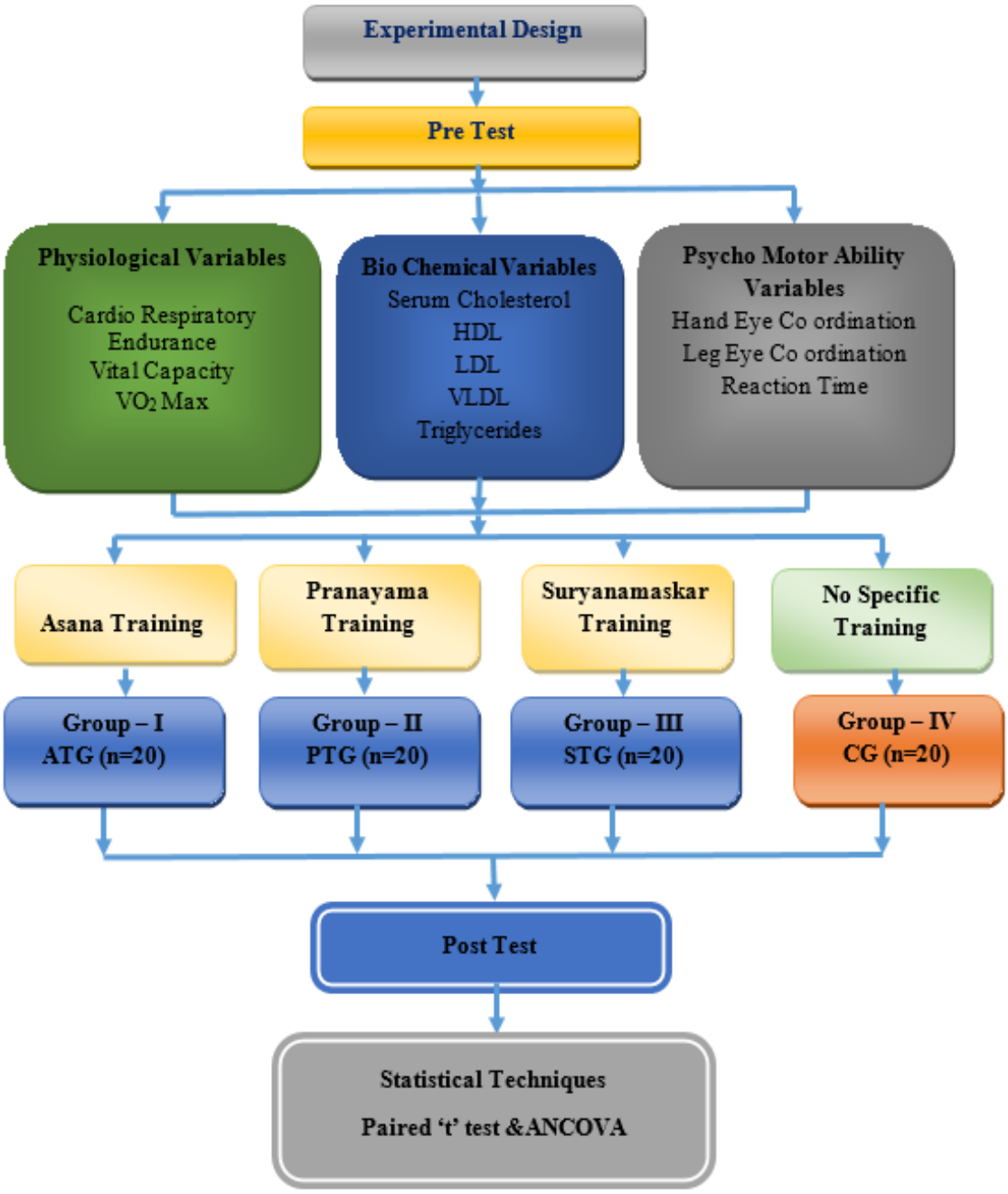
Psycho Motor Ability Variables

- Hand Eye Coordination
- Leg Eye Coordination
- Reaction Time

3.3 EXPERIMENTAL DESIGN

The study was formulated as a random group design, mainly aimed to find out the efficacy of isolated asana, pranayama and suryanamaskar training on selected physiological, bio-chemical and psychomotor ability variables of college men. For this purpose 80 college men students were randomly selected as subjects from Sri Venkateswara University affiliated Colleges namely, Sri Venkateswara University College, Tirupathi,, Sri Venkateswara University College of Engineering, Tirupathi and SEICOM Degree College, Tirupathi, Chittoor District, Andhra Pradesh, India, and their age was ranged from 17 years to 21 years. They subjects were divided in to four equal groups (three experimental and one control groups). The three experimental groups namely asana training group (ATG, twenty each), pranayama training group (PTG, twenty each) and suryanamaskar training group (STG, twenty each) and control group (CG, twenty each). In these, three experimental groups were undergone 12 weeks of asana training, pranayama training and suryanamaskar training and the control group was not exposed to any specific training, but they were participating in their regular training schedule. The training was given on 5 days per week, except saturday and sunday. The training was given from 5.30 P.M. to 6.30 P.M. for 12 weeks. All the 80 subjects were tested on the selected criterion variables namely physiological variables namely cardio respiratory endurance (CRE), vital capacity (VC) and VO_2 Max. bio-chemical variables namely serum cholesterol (SC), high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL) and triglycerides (TG) and psychomotor variables namely hand eye coordination (HEC), leg eye coordination (LEC) and reaction time. The pre-tests score were taken before the training period and post-tests were taken after the training period.

EXPERIMENTAL DESIGN FLOW CHART



3.4 PILOT STUDY

A Pilot study was conducted to assess the initial ability and the capacity of the subjects in order to design the training programme for this purpose of ten college men for each group were selected at random from the selected subjects and they were subjected to asana, pranayama and suryanamaskar trainings under the watch full eyes of experts and the investigator, based on the results of the pilot study, the training schedule was designed for the experimental groups. The tests were administered and the scores were recorded. The test procedures of dependent variables for the pre test were strictly followed in the post test. A pilot study was conducted in which ten college men for each group from Sri Venkateswara University affiliated Colleges, Tirupathi, Chittoor District, Andhra Pradesh, India.

3.5 CRITERION MEASURES

After going through the related literature and in consultation with the professional experts, the following variables were selected as criterion measures for testing the hypothesis of the study, and they are shown in table -I.

TABLE II

SELECTED VARIABLES AND THEIR STANDARD TEST ITEMS

S.No.	Dependent Variables	Test Items / Equipments	Unit of Measuremetns
Physiological Variables			
1.	Cardio Respiratory Endurance (CRE)	Cooper 12 Minutes run / walk test	Meters
2.	Vital Capacity (VC)	Wet Spiro meter test	Cubic Centimeters
3.	VO_2 Max.	VO_2 Max. Step Test	$ml.kg^{-1}.min^{-1}$
Bio-Chemical Variables			
4.	Serum Cholesterol (SC)	Lab Test	mg / dl
5.	High Density Lipoprotein (HDL)	Lab Test	mg / dl
6	Low Density Lipoprotein (LDL)	Lab Test	mg / dl
7.	Very Low Density Lipoprotein (VLDL)	Lab Test	mg / dl
8.	Triglycerides (TG)	Lab Test	mg / dl
Psychomotor Ability Variables			
9.	Hand Eye Coordination (HEC)	Drawing Trace Board Test	In number
10.	Leg Eye Coordination (LEC)	Football Wall Kick Test	In number
11.	Reaction Time (RT)	Chronometer	In seconds

3.6 RELIABILITY OF DATA

The reliability of the data was ensured by establishing the instruments reliability, tester's competency and reliability of the tests as mentioned below.

3.7 RELIABILITY OF INSTRUMENTS

The instruments used in the study were calibrated and standardized one, since it was produced from standardized company, it was considered as reliable. They were considered accurate enough to serve for the purpose of the study.

1. 16 Inches Step Box
2. Stop watch
3. Wall and Football
4. Mirror Drawing Trace Board
5. Wet Spiro Meter
6. Measuring Tape

3.8 TESTERS' RELIABILITY

To ensure the testers reliability that the investigator is well versed with the yoga techniques of conducting the test, the investigator have number of practice session, in the testing procedure with the guidance of the guide and subject experts. The investigator himself looks at all the measurement in his study.

Tester's competency was evolved together with the reliability of test and to determine the reliability of the test, the test retest method was followed. The performance of 80 college

men subjects are selected at random on the chosen variables, were recorded twice under similar condition by the investigator the score thus obtained by test, retest method is correlated by using to product moment correlation and the result is given below.

TABLE III

RELIABILITY CO- EFFICIENT OF CORRELATION OF TEST-RETEST SCORES ON SELECTED PHYSIOLOGICAL BIO-CHEMICAL AND PSYCHOMOTOR ABILITY VARIABLES

S.No	Criterion Variables	' r' Value
1	Cardio Respiratory Endurance (CRE)	0.91*
2	Vital Capacity (VC)	0.92*
3	VO_2 Max.	0.93*
4	Serum Cholesterol (SC)	0.89*
5	High Density Lipoprotein (HDL)	0.87*
6	Low Density Lipoprotein (LDL)	0.88*
7	Very Low Density Lipoprotein (VLDL)	0.91*
8	Triglycerides (TG)	0.91*
9	Hand Eye Coordination (HEC)	0.93*
10	Leg Eye Coordination (LEC)	0.86*
11	Reaction Time (RT)	0.85*

3.9 SUBJECTS RELIABILITY

The above test, re-test co-efficient of correlation values show that the subjects reliability was adequate as the same subjects were used under similar conditions by the same tester and no motivational techniques were used. The pre-test and post-test methods were used to find out the subjects' reliability.

3.10 TRAINING PROGRAMME

During the training period, the three experimental group underwent their respective training programme. The procedure adopted in the training programme for the present study is described in the following aspects. Based on the literature available and the opinion of the experts the following training details were determined in the yogic training.

- Duration on the training - 12 week
- Number of days per week - 5 days
- Number of subjects - 80 subjects
- Number of session per day - 1session, i.e., evening (1 Hour)

Efficacy of isolated asana pranayama and suryanamaskar trainings on selected physiological bio-chemical and psychomotor ability variables of college men for 12-Weeks are given below.

3.11 ASANA TRAINING SCHEDULE

This group underwent asana training programme consists of the 12 different asana. The (1 to 4 weeks) the subjects were asked to do 10 minutes of warming up, 40 minutes of asana training and 10 minutes of warm down. In every asana with repetitions 2, rest between repetitions 45 seconds. Each asana has been performed for 1 minute duration. In each station the subjects were asked to do particular repetitions according to the asana. The (5 to 8 weeks) the subject were asked to do 10 minutes of warming up, 42 minutes of asana training, 8 minutes of warm down. In every asana with repetitions 2, rest between repetitions 45 seconds. Each asana has been performed for 1 minute duration. In each station the subjects were asked to do particular repetitions

according to the asana. The (9 to12 weeks) the subjects were asked to do 7 minutes of warming up, 48 minutes of asana training 5 minutes of warm down. In every asana with repetitions 3, rest between repetitions 40 seconds. Each asana has been performed for 40 seconds duration. In each station the subjects were asked to do particular repetitions according to the procedures of asana. The subjects did the one hour asana training for 12 weeks and 5 days per week only in the evening sessions between 5.30 P.M. and 6.30 P.M.

TABLE IV

ASANA TRAINING SCHEDULE FOR FIRST WEEK TO FOURTH WEEK

S.No.	Name of the Asana	Repetitions	Duration of Asana	Rest Between Repetition	Total Duration
Warming Up					10 minutes
1	Vajrasana	2	1 min.	45 Sec.	3.30 mins.
2	Supta Vajrasana	2	1 min.	45 Sec.	3.30 mins.
3	Paschimotanasana	2	1 min.	45 Sec.	3.30 mins.
4	Bhujangasana	2	1 min.	45 Sec.	3.30 mins.
5	Sarvangasana	2	1 min.	45 Sec.	3.30 mins.
6	Salabhasana	2	1 min.	45 Sec.	3.30 mins.
7	Dhanurasna	2	1 min.	45 Sec.	3.30 mins.
8	Halasana	2	1 min.	45 Sec.	3.30 mins.
9	Navasana	2	1 min.	45 Sec.	3.30 mins.
10	Padahastasana	2	1 min.	45 Sec.	3.30 mins.
11	Vakrasana	2	1 min.	45 Sec.	3.30 mins.
12	Savasana	2	1 min.	45 Sec.	3.30 mins.
Warm Down					10 minutes
Total					60 minutes

TABLE V

ASANA TRAINING SCHEDULE FOR FIFTH WEEK TO EIGHTH WEEK

S.No.	Name of the Asana	Repetitions	Duration of Asana	Rest Between Repetition	Total Duration
Warming Up					10 minutes
1	Vajrasana	2	75 Sec.	30 Sec.	3.30 mins
2	Supta Vajrasana	2	75 Sec.	45 Sec	3.30 mins
3	Paschimotanasana	2	75 Sec.	45 Sec	3.30 mins
4	Bhujangasana	2	75 Sec.	45 Sec	3.30 mins
5	Sarvangasana	2	75 Sec.	45 Sec	3.30 mins
6	Salabhasana	2	75 Sec.	45 Sec	3.30 mins
7	Dhanurasna	2	75 Sec.	45 Sec	3.30 mins
8	Halasana	2	75 Sec.	45 Sec	3.30 mins
9	Navasana	2	75 Sec.	45 Sec	3.30 mins
10	Padahastasana	2	75 Sec.	45 Sec	3.30 mins
11	Vakrasana	2	75 Sec.	45 Sec	3.30 mins
12	Savasana	2	75 Sec.	45 Sec	3.30 mins
Warm Down					8 minutes
Total					60 minutes

TABLE VI

ASANA TRAINING SCHEDULE FOR NINTH WEEK TO TWELFTH WEEK

S.No.	Name of the Asana	Repetitions	Duration of Asana	Rest Between Repetition	Total Duration
Warming Up					7 minutes
1	Vajrasana	3	40 Sec.	40 Sec.	4 mins.
2	Supta Vajrasana	3	40 Sec.	40 Sec.	4 mins.
3	Paschimotanasana	3	40 Sec.	40 Sec.	4 mins.
4	Bhujangasana	3	40 Sec.	40 Sec.	4 mins.
5	Sarvangasana	3	40 Sec.	40 Sec.	4 mins.
6	Salabhasana	3	40 Sec.	40 Sec.	4 mins.
7	Dhanurasna	3	40 Sec.	40 Sec.	4 mins.
8	Halasana	3	40 Sec.	40 Sec.	4 mins.
9	Navasana	3	40 Sec.	40 Sec.	4 mins.
10	Padahastasana	3	40 Sec.	40 Sec.	4 mins.
11	Vakrasana	3	40 Sec.	40 Sec.	4 mins.
12	Savasana	3	40 Sec.	40 Sec.	4 mins.
Warm Down					5 minutes
Total					60 minutes

3.11.1 Asanas Selected for Training and its Procedures

Vajrasana

Instruction

1. Bend the knees and sit on the buttocks
2. The sides of the soles should be close together
3. Interlock the big toes
4. Maintain the posture so that the spine and neck are absolutely straight
5. Place the palms on the knees and relax the shoulders
6. Balance the body in this position while taking deep and even breaths
7. Do not lean back or allow the spine to arch backwards
8. Keep the eyes closed and remain conscious of the breathing
9. Inhale and exhale slowly and allow the mind and body to relax completely

Supta Vajrasana

Instruction

1. The subjects sat in vajrasana with heels pointing outwards and big toes touching the body was upright, hands rest on the thighs. Relax the whole body
2. Breathing normally place the hands on the floor beside the buttocks
3. Bend the elbows and slowly lean the body back until the elbows rest on the floor
4. Lower the head backward until the top of the head touches the floor
5. Bring palms together in front of the chest and hold the posture

6. Breathing was fully relaxed and slightly deeper than normal, inhale through the nose and exhale through the mouth
7. With the help of the elbows slowly return to the starting position

Paschimotanasana

Instruction

1. The subject sat in a long sitting position by stretching the legs forward with the heels and the big toes of both legs touching each other
2. The subject slowly raised the arms forward and upward palms facing forward at shoulder width distance
3. As the arms reach above head position stretch up to straighten the back
4. Ensuring the bending at hips, the subject slowly bends down and tries to hold the maximum reachable part either of the knees, ankles or the sole of the feet so that the back was not arched badly and no bent at knees occur

Bhujangasana

Instruction

1. Start with lying down on the floor on the stomach in a comfortable level preferably on a yoga mat. Keep the feet together with the tops of them against the floor
2. Now spread the hands on the floor under the shoulders and hug the elbows against the rib cage. After doing this close the eyes, and inhale slowly but deeply
3. Exhale gradually before opening the eyes, continue breathing process (Inhale-exhale) slowly and deeply. As you inhale, the arm should be steadily straightened

and this feels uncomfortable. Extend through and deepen the stretch to create a graceful arc in the back

4. Keep the shoulders broad but in relaxed, with the blades low on the back. Now lift from the top of the sternum, but try to avoid pushing the front of the ribs forward. Puff the side ribs forward and keep the lower back in relaxed, and trying to distribute the stretch evenly along the spine. In upward position trying to hold for some time and come back to starting position or lying down position

Sarvangasana

Instruction

1. Lying on the back with the hands under the mid-back, the legs and lower body are lifted so that the weight of the body is supported on the head, neck, shoulders and upper arms
2. The gaze is towards the toes and the sagittal and transverse line of the head is perpendicular with the midsagittal and midfrontal line of the body

Salabhasana

Instruction

1. Lie on the belly with the arms along the sides of the torso. The palms should face up and the forehead should rest against the floor
2. Turn the big toes toward each other to inwardly rotate the thighs, and firm the buttocks so that the tail bone (coccyx) presses toward the pubis
3. Exhale and lift the head, upper torso, arms, and legs away from the floor. You will be resting on the lower ribs, belly, and the front of the pelvis

4. Firm the buttocks and reach strongly through the legs, first through the heels to lengthen the muscles at the back of the legs, then through the bases of the big toes
5. Raise the arms parallel to the floor and stretch back actively through the fingertips
6. Gaze forward or slightly upward, being careful not to extend the chin forward and crunch the back of the neck
7. Keep the base of the skull lifted and the back of the neck long
8. Stay for 30 seconds to 1 minute in this position and then release with an exhalation

Dhanurasana

Instruction

1. The subjects begin lying down on the stomach, reach back and grasp the ankles. Inhale and lifting legs, head and chest, arch the back into a bow
2. Retain breath, then exhale and lie flat. Repeat the process
3. Slowly release and exhale

Halasana

Instruction

1. First do sarvangasana
2. Then release the breath step by step and get the legs above the head and make it touch the ground
3. Make sure that the distance between the head and the legs where it is touching the earth is more. As far as keep the legs and toes straight

4. Then join the fingers of both the hands and keep it below the back. At the time keep the back straight vertically
5. At this stage give more pressure to the stomach by increasing the pressure at the hip and keep the legs parallel to the body or earth
6. Be in the normal breath as soon as possible and come back to sarvangasana then return to starting position

Navasana

Instruction

1. Lie down on the supine position (back)
2. The feet should be together and stretched and the arms are besides of the legs
3. Inhale raises the entire body at 30 degree so that you can see the toes with eyes
4. Keep the palms above the thighs
5. Remain in the pose as long as you can maintain. Initially, it may be 20 seconds, increases the time up to 2 minutes
6. While maintaining the pose, feel the stretching on the navel area
7. Bring the body down with deep exhale and relax
8. Inhale - exhale slowly while maintaining the pose

Padahastasana

Instruction

1. Stand on the floor in an upright position with the hands held loosely at the sides
2. Lift the hands straight up and allow the palms to lightly touch each other

3. Exhale and stretch the arms out while slowly bending at the waist
4. Keep bending until the hands reach the toes. The chin should come in contact with the knees
5. Exhale and bend downwards from the hips until the hands reach the toes
6. Hold the toes with the hands and remain steady. Relax

Vakrasana

Instruction

1. The subjects sat erect with the legs stretched out. Make sure that the feet are placed together and spine was absolutely erect
2. Now, bend the left leg such that the heel of the left foot lies next to the right hip. One could also kept the left leg stretched out if like
3. Then, place the right leg next to the left knee by taking it over the knee
4. Twist the waist, neck, and shoulders towards the right, and set the gaze over right shoulder. Make sure that the spine was erect
5. Hold the pose for a few seconds, about 30 to 60 seconds as you breathe slowly, yet deeply
6. Exhale and release the right hand, and then the waist, chest, and finally the neck. Relax as the sat straight
7. Repeat the steps on the other side, and then exhale and came back to the front

Savasana

Instruction

1. First, lie down straight on your back on the floor. Put or maintain a distance of 1 foot in between your legs
2. Now slowly close your eyes keep your neck erect and relax your whole body
3. After that slowly – slowly take deep breaths about 5 to 6 time

3.12 PRANAYAMA TRAINING SCHEDULE

TABLE VII

PRANAYAMA TRAINING SCHEDULE FOR FIRST WEEK TO FOURTH WEEK

S.No.	Name of the Pranayama	Duration of each Pranayama	Set	Rest Between Set	Duration	Total Duration
1	Surya Bhedana	1 min.	2	2 mts.	6 mts.	60 minutes
2	Chandra Bhedana	1 min.	2	2 mts.	6 mts.	
3	Nadisuddhi	1 min.	2	2 mts.	6 mts.	
4	Bhastrika	1 min.	2	2 mts.	6 mts.	
5	Ujjayi	1 min.	2	2 mts.	6 mts.	
6	Kapala Bhati	1 min.	2	2 mts.	6 mts.	
7	Sitali	1 min.	2	2 mts.	6 mts.	
8	Sitkari	1 min.	2	2 mts.	6 mts.	
9	Bhramari	1 min.	2	2 mts.	6 mts.	
10	Relax in Savasana				6 mts	

TABLE VIII

PRANAYAMA TRAINING SCHEDULE FOR FIFTH WEEK TO EIGHTH WEEK

S.No.	Name of the Pranayama	Duration of each Pranayama	Set	Rest Between Set	Duration	Total Duration
1	Surya Bhedana	1 min.	3	1 min.	6 mins.	60 minutes
2	Chandra Bhedana	1 min.	3	1 min.	6 mins.	
3	Nadisuddhi	1 min.	3	1 min.	6 mins.	
4	Bhastrika	1 min.	3	1 min.	6 mins.	
5	Ujjayi	1 min.	3	1 min.	6 mins.	
6	Kapala Bhati	1 min.	3	1 min.	6 mins.	
7	Sitali	1 min.	3	1 min.	6 mins.	
8	Sitkari	1 min.	3	1 min.	6 mins.	
9	Bhramari	1 min.	3	1 min.	6 mins.	
10	Relax in Savasana				6 mins	

TABLE IX

PRANAYAMA TRAINING SCHEDULE FOR NINTH WEEK TO TWELFTH WEEK

S.No.	Name of the Pranayama	Duration of each Pranayama	Set	Rest Between Set	Duration	Total Duration
1	Surya Bhedana	1:30 mins.	2	1:30 mins.	6 mins.	60 minutes
2	Chandra Bhedana	1:30 mins.	2	1:30 mins.	6 mins.	
3	Nadisuddhi	1:30 mins.	2	1:30 mins.	6 mins.	
4	Bhastrika	1:30 mins.	2	1:30 mins.	6 mins.	
5	Ujjayi	1:30 mins.	2	1:30 mins.	6 mins.	
6	Kapala Bhati	1:30 mins.	2	1:30 mins.	6 mins.	
7	Sitali	1:30 mins.	2	1:30 mins.	6 mins.	
8	Sitkari	1:30 mins.	2	1:30 mins.	6 mins.	
9	Bhramari	1:30 mins.	2	1:30 mins.	6 mins.	
10	Relax in Savasana				6 mins	

3.12.1 Pranayamas Selected for Training and their Procedures

Surya Bhedana Pranayama

Instruction

1. Sit on Padmasana or Siddhasana. Close the eyes. Keep the left nostril closed with right ring and little fingers. Slowly inhale without making any sound as long as you can do it comfortably through the right nostril

2. Then close the right nostril with right thumb and retain the breath firmly pressing the chin against the chest (Jalandhara Bandha). Hold on the breath till perspiration oozes from the tips of the nails and roots of the hairs (hair follicles). This point cannot be reached at the very outside. Increase the period of Kumbhaka gradually, this is the limit of the sphere of practice of surya bheda kumbhaka
3. Then exhale very slowly without making any sound through the left nostril by closing the right nostril with the thumb. Exhale after purifying the skull by forcing the breath up
4. This Pranayama should again and again be performed, as it purifies the brain and destroys the intestinal worms and diseases arising from excess of wind (vayu). This removes the four kinds of evils caused by vayu and cures vata

Chandra Bhedana Pranayama

Instruction

1. Sit on Padmasana. Close the eyes. Keep the right nostril closed with right thump finger. Slowly inhale without making any sound as long as you can do it comfortably through the left nostril
2. Then close the left nostril with the right ring and little fingers and retain the breath firmly pressing the chin against the chest (Jalandhara Bandha). Hold on the breath till perspiration oozes from the tips of the nails and roots of the hairs (hair follicles). This point cannot be reached at the very outside. Increase the period of Kumbhaka gradually. This is the limit of the sphere of practice of Chandra Bheda Kumbhaka

3. Then exhale very slowly without making any sound through the right nostril by closing the left nostril with the right ring and little fingers. Exhale after purifying the skull by forcing the breath up
4. This Pranayama should again and again be performed, as it purifies the brain and destroys the intestinal worms and diseases arising from excess of wind (vayu). This removes the four kinds of evils caused by vayu and cures vata

Nadi Suddhi Pranayama

Instruction

1. Sit in padmasana or sit in vajrasana who cannot sit properly in padmasana
2. Close the left nostril by right hand ring finger exhale the breath fully by the right side nostril
3. Then inhale the breath form right side nostril, it must be a gentle process not too fast or too slow
4. Fill the lungs with full of wind then close the right nostril by the right thump and exhale the breath by the left nostril fully
5. Now inhale by the left nostril and fill the lungs with full of wind then close the left nostril exhale the wind by the right nostril fully
6. This is the one round of nadisuddhi. Likewise one can do at least ten to twenty times. If the person likes to do more times, then he can do that also

Bhastrika Pranayama

Instruction

1. Sit on Padmasana. Keep the body, neck and head erect
2. Close the mouth. Next, inhale and exhale quickly ten times like the bellows of the blacksmith. Constantly dilate and contract. While practise this Pranayama a hissing sound is produced
3. The practitioner should start with rapid expulsions of breath following one another in rapid succession
4. When the required number of expulsions, say ten for a round, is finished, the final expulsion is followed by a deepest possible inhalation
5. The breath is suspended as long as it could be done with comfort. Then deepest possible exhalation is done very slowly
6. The end of this deep exhalation completes one round of Bhastrika
7. Rest a while after one round is over by taking a few normal breaths. This will give you relief and make you fit for starting the second round

Ujjayi Pranayama

Instruction

1. To practice ujjayi pranayama, the breath is inhaled deeply through the nostrils, with the glottis at the back of the throat slightly constricted so that it makes a gentle hissing sound
2. The constriction is maintained on the exhalation, which is also through the nose

3. It can be practiced with a retention of breath at the top of the inhalation, although this is optional
4. The oceanic, whispering or hissing sound produced during ujjayi pranayama is known as a japa mantra, or unspoken mantra
5. This is said to slow down the breath, focus awareness and smooth the flow of air
6. The sound can also be an anchor for the mind, preventing it from wandering

Kapala Bhati Pranayama

Instruction

1. Sit comfortably with the spine erect. Place the hands on the knees, palms open to the sky
2. Take a deep breath in
3. While exhale, pull the stomach. Pull the navel in back towards the spine. Do as much as comfortably can
4. While relax the navel and abdomen, the breath flows into the lungs automatically
5. Take 20 such breaths to complete one round of KapalBhati pranayama. Start with 30 times or 1 min. increase upto 5 mins min. upto 10 mins max
6. After completing the round, relax with eyes closed and observe the sensations in the body

Sitali Pranayama

Instruction

1. Sit in Easy Pose with a straight spine
2. Take jnana mudra (first finger and thumb touching) and rest the hands on the knees
3. Curl the tongue by curving the sides upward. Let the tongue stick out just past the lips
4. Inhale deeply through the tongue and mouth. Now the air glides through the tongue. Breathe in to the belly
5. Exhale fully through the nose
6. To close, on the last inhale, retain the breath. Exhale and relax

Sitkari Pranayama

Instruction

1. Fold the tongue so that the tip of the tongue might touch the upper palate and draw the air through the mouth with a hissing sound C C C C (or Si, Si, Si, Si)
2. Then retain the breath as long as you can without the feeling of suffocation and then exhale slowly through both nostrils
3. You can keep the two rows of teeth in contact and then inhale the air through the mouth as before

Bhramari Pranayama

Instruction

1. Sit up straight in a quiet, well ventilated corner with the eyes closed. Keep a gentle smile on the face
2. Place the thump fingers on the ears. There is a cartilage between the cheek and ear. Place the thump fingers on the cartilage
3. Take a deep breath in and while breathe out, gently press the cartilage and make a loud humming sound like a bee
4. Make a low-pitched sound but it is a good idea to make a high-pitched one for better results
5. Keep the eyes closed for some time. Observe the sensations in the body and the quietness within

3.13 SURYANAMASKAR TRAINING SCHEDULE

TABLE X

SURYANAMASKAR TRAINING SCHEDULE FOR 12 WEEKS

No. of Week	Day	Set	Density Between Sets	Duration
I & II Week	Warming Up	1	2 Minutes	10 Minutes
	Suryanamaskar (12 Poses)	10		40 Minutes
	Cool Down	1		10 Minutes
III & IV Week	Warming Up	1	2 Minutes	9 Minutes
	Suryanamaskar (12 Poses)	11		42 Minutes
	Cool Down	1		9 Minutes
V & VI Week	Warming Up	1	2 Minutes	8 Minutes
	Suryanamaskar (12 Poses)	12		44 Minutes
	Cool Down	1		8 Minutes
VII & VIII Week	Warming Up	1	2 Minutes	7 Minutes
	Suryanamaskar (12 POSES)	13		46 Minutes
	Cool Down	1		7 Minutes
IX & X Week	Warming Up	1	2 Minutes	6 Minutes
	Suryanamaskar (12 Poses)	14		48 Minutes
	Cool Down	1		6 Minutes
XI & XII Week	Warming Up	1	2 Minutes	5 Minutes
	Suryanamaskar (12 POSES)	15		50 Minutes
	Cool Down	1		5 Minutes

3.13.1 Procedure of Doing Suryanamaskar

Suryanamaskar (12 –POSES)

"Suryanamaskar" is a series of gentle flowing movement synchronized with the breath. This excellent warm up exercise consists of a sequence of positions that move the spine in various ways and promote flexibility in the limbs. It is of special benefit to beginners, to stiff people, since it helps the body to gain flexibility. It also regulates the breath and focus the mind.

Stand erect with the head and body straight but relaxed. The feet are together and knees are straight and the arms are relaxed at the sides of thigh. In hale deeply and begin.

- Bring the hands up from the sides wards, join the palms and place them each other in front of the chest
- Inhale and slowly bring the arms upward over the head
- Exhale and slowly bring the trunk and bend forward and keep the hands by the side of the legs
- Inhale and stretch the right leg back and keep the left leg in between the hands. Same as left leg also
- Exhale and lie down to floor and the body closer to the floor and inhale elevate the hip a little and exhale there it
- Inhale and bring the upper body up and keep the hands by the side of the ribs
- Exhale and elevates the hip maximum height and the palms and foot sole fully contact on the floor

- Inhale and bring the right leg in between the hands and same as left leg also
- Exhale and keep the fore head closer to the knee and join the palms together
- Inhale and bring the arms over the head make an arch on back and hands in namaskar pose
- Exhale and bring the hands in front of the chest in namaskar pose

3.14 ADMINISTRATION OF TESTS

The investigator held a meeting with the subjects prior to the administration of the tests. In this, the significance of the study and the requirements of the testing procedure were clearly explained to them in detail so as to leave no doubt in their minds, regarding the efforts which they were required to put in for the successful completion of the tests.

For assessing the variables, the investigator explained to the subjects the purpose of the investigation and gave clear instructions to them regarding the method of conducting each test. The investigator demonstrated the tests so that the subjects could imitate them. They were asked also to respond as quickly as possible in case of any doubt. The scores obtained from the performance of the subject were tabulated and statistically treated so as to arrive at meaningful conclusions.

3.14.1 12 Minutes Run / Walk Test

Purpose

To measure the cardiovascular endurance of the subjects.

Equipments and Materials

Whistle, measuring tape, score card, pencil, stop watch and 400m standard track

Procedure

Each runner was assigned a separate spotter. The runners stood behind a line and on hearing the starting signal, run or walked as many rounds as possible around the course within 12 minutes. The spotters maintained a record of each lap, and when the signal to stop was given, the spotters immediately ran to the spots where their runners were at that instant when the whistle or command to stop was given. This is shown in figure 6 below.

Scoring

The total distance covered by each subject was measured and recorded in meters.

3.14.2 Vital Capacity Test

Purpose

To measure the forced vital capacity

Equipments

Wet spirometer, Water, Disposable cardboard mouth pieces, sprit and cotton.

Administration

The investigator was given the instruction to the subjects to sit comfortably on the chair and to inhale maximum outside from the wet spirometer. Then subject was asked to grasp the cardboard mouthpiece between the lips to make a good seal and expire the air in wet spirometer as much and as possible for as long as possible until no breath was left in the lungs, once again researcher was asked to student to grasp the mouthpiece between the lips to create a good seal and inhale and exhale 2-3 times. Then breathe in maximum

capacity, expire breathe as much possible and as long as possible until no breath was left in the lungs. The researcher encouraged to the subjects continuously to ensure the best effort. For an acceptable test, the effort should be performed efficiently and cough free and exhalation time at least seven seconds. Each attempt had to be performed thrice and the value best of the three was noted. Before going to the next performer, the disposable mouth piece was to be changed. When the performer was ready to blow out the breath, the unit had to be recalibrate wet spirometer

Scoring

The best of 3 trials was recorded in cubic Millimeter.

3.14.3 VO_2 Max. Test

Purpose

This sub-maximal test provides a measure of VO_2 Max.

Equipments

16.25 inches / 41.3 cm. step, stopwatch, metronome, and heart rate monitor (optional).

Procedure

To perform this VO_2 Max. Test need a step that was 16.25 inches from ground level, a stopwatch, and a metronome. Do some light stretching before the test and practice stepping up and down according to the following sequence: left leg up, then right leg up, then left leg down, then right leg down, and repeat. This was the sequence the subject must use for the test. Now the metronome was set to 96 beats per minute. During the test, for each beat of the metronome the subject took one step per beat (i.e. on the first beat the left leg goes up, on the second beat your right leg goes up, on the third beat the

left leg goes down, etc.). Begin the test and step to the beat for exactly 3 minutes. When the 3 minutes was completed stop stepping, waited for exactly 5 seconds, and then take the pulse for 15 seconds. Once all of this was done, enter the 15 second pulse count into the field below to calculate the estimated VO_2 Max.

Scoring

An estimation of VO_2 Max. was calculated from the test results, using this formula (Mc Ardle et al., 1972). The 16.25 inch step for the test was much higher than typical step height. The subjects performed some practice steps to feel conforming this test and exercise caution during the test.

Men: Maximal oxygen uptake for men =111.33 - (0.42 recovery heart rate in b.p.m). (Johnson & Nelson, 2007).

3.14.4 Lipid Profile Test

Purpose

To measure the Serum Cholesterol, HDL, LDL, VLDL and triglycerides

Equipments

Laboratory test

Administration

The blood sample was taken from the subject and through lab test the lipid profile namely Serum Cholesterol, HDL, LDL, VLDL and triglycerides were measured.

Scoring

The serum cholesterol, HDL, LDL, VLDL and triglycerides were measured in mg / dl.

3.14.5 Hand Eye Coordination Test

Purpose

To measure the hand eye coordination.

Equipments

Mirror tracing instrument, score sheet

Procedure

The simplest type of mirror drawing apparatus consisted of a base board at the back side of a mirror holder was attached to which mirror can be fitted to stand erect. At right hand of front edge, there was an adjustable screen. With the apparatus printed star patterns are used. Those were mounted on the elevated aluminium platform in the middle of base board with the help of you pins. A printed star pattern was required for each trial. The subject traces the star pattern with a needle viewing its image in the mirror. As the needle touches or crosses the inner or outer boundaries of the star pattern, an error was committed. The subject was advised not to touch or cross the boundaries of the star pattern. All the errors in each trail were marked and recorded manually. (Each touch of crossing of the inner or outer boundary of the star pattern)

Scoring

The number of errors in the trail was recorded as score.

3.14.6 Leg Eye Coordination Test

Purpose

This test measures the leg eye coordination ability of the subject to kick a football successively against the wall within a given target are and from a specified distance on the floor.

Equipments

Footballs and a stop watch.

Procedure

On the flat wall space, a target area 4 feet wide was marked at 2 ½ feet from the floor. On the floor, extending from and parallel to the wall target, a similar area (4 feet wide and 2 ½ feet long) was marked the 4 feet line on the floor at the greatest distance from the wall target was extended 1 foot on either side, and continues the restraining line.

The football was placed behind the restraining line at any position the subject chooses (usually towards the centre of the line). On the signal “go” the subject kicks the football against the wall into the target area and as it rebounds, he continued to kick it repeatedly against the wall. If the ball gets out of his control, the subjects retrieves it, brings it back to the restraining line and the target. If the football stops with in this area, he must remove it with his foot. Whenever the ball goes outside of this rectangular floor area, the subject may use his hands in retrieving the ball.

A successful hit was one in which the ball was kicked into the target area on the wall from the behind the restraining line on the floor. Balls hitting the target line were not

fair hits. To score a fair hit, the subject must kick the ball from in back of restraining line (not on it) and the ball must land between the lines that bound the wall target.

Scoring

One point was given for each successful hit. Each time the ball was touched with the hand when it was inside the rectangular floor area; one point was subtracted from the score. The subject was given a 15 second practice trail. For which the score was not recorded. The test administrator scores verbally during this trail, calling attention to illegal hits. Four 15 seconds trails were given after the practice trail. The total number of points was recorded for each trail. The best one of the trails was the final score for the test.

3.14.7 Reaction Time Test

Purpose

To measures the reaction ability.

Equipment

Chronometer

Procedure

The subjects were asked to sit in front of the reaction timer. When the tester pressed the push button for bell which served as the ready signal for the subject. The tester then pressed either of the two micro switches that act as the stimulus by producing light ask the subjects to press the required switch as soon as either of two small neon lights produced and also to release the finger. Then time counter showed his reaction time (response) to that stimulus. Then reset the timer for next subject for reading.

Scoring

Average of all the ten time trails in seconds for reaction were taken as the score for calculation.

3.15 COLLECTION OF DATA

For the purpose of collection of data the subjects were asked to reports in the evening, one day prior to the commencement of training and one day after the training, that day the data was collected.

3.16 STATISTICAL TECHNIQUES

The following statistical techniques were used for the analysis of data in this study. t-test was used to find out the efficacy of isolated groups' improvement between pre and post tests. Analysis of covariance (ANCOVA) was applied to determine the significant mean difference between the three experimental groups and one control group. Whenever the 'F' ratio was found to be significant, where the pair wise comparison was applied to test the significant difference between the paired means. In all cases, 0.05 level of confidence ($p < 0.05$) was fixed for all the variables to test the level of significance.

Chapter IV

Results and Discussion

CHAPTER IV

RESULTS AND DISCUSSIONS

4.1 OVERVIEW

This chapter deals with the analysis of data collected from the samples understudy. The purpose of this study was to find out the efficacy of isolated asana, pranayama and suryanamaskar on selected physiological, bio-chemical and psychomotor ability variable of college men of Sri Venkateswara University affiliated colleges namely Sri Venkateswara University College, Tirupathi, Sri Venkateswara University College of Engineering, Tirupathi, SEICOM Degree College, Tirupathi, Chittoor District, Andhra Pradesh, India. I randomly selected 80 students and they were assigned into four equal groups. Each group consists of twenty subjects. Experimental groups namely asana training group (ATG), pranayama training group (PTG), suryanamaskar training group (STG) and control group (CG). In these all three experimental groups had undergone 12 weeks of asana, pranayama and suryanamaskar practices respectively and the control group was not exposed to any specific training but they were participating in their regular activity. All the 80 subjects were tested on the selected physiological variables namely cardio respiratory endurance, vital capacity, VO_2 Max, bio-chemical variables namely serum cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL), triglycerides (TG), and psychomotor ability variables, namely hand eye coordination, leg eye coordination and reaction time. The pre-tests were taken before the respective training period and post-tests were taken after the training period. pre test and post test scores were subjected to statistical analysis by using paired ‘t’ test and analysis of covariance (ANCOVA) to find out the significant improvement

between pre and post mean differences among the groups and whenever the 'F' ratio for adjusted post test was found to be significant. Paired mean comparisons were found in order to find out which paired mean has got significant differences. In all cases 0.05 level of significance was fixed to test hypothesis.

4.2 TEST OF SIGNIFICANCE

This is the vital portion of thesis in achieving the conclusion by examining the hypotheses. The procedure of testing the hypotheses were either by accepting the hypotheses or rejecting the same in accordance with the results obtained in relation to the level of confidence.

The test was usually called the test of significance since we test whether the differences among the four groups were significant or not. In this study, if the obtained 'p' values were lesser than the 0.05 value, the hypotheses we accepted to the effect that there existed significant difference among the means of the groups compared and if the obtained 'p' values were greater than the 0.05 values, then the hypotheses were rejected to the effect that there were, no significant differences among the means of the groups under study.

4.3 LEVEL OF SIGNIFICANCE

The purpose of this study was to find out the effect of isolated asana, pranayama and suryanamaskar training on selected physiological, bio chemical and psychomotor ability variables of college men. The data collected on the selected criterion variables were subjected to statistical analyze by using paired 't' test and analysis of covariance (ANCOVA) to find out the significant difference if any, between pre and post tests and differences among the groups on the selected criterion variables separately. In all the cases, 0.05 level of confidence was fixed to test the significance, which was considered as appropriate for this study.

TABLE XI

COMPUTATION OF "t" RATIO BETWEEN PRE AND POST TESTS ON ASANA TRAINING GROUP

Variables	Test	Mean	Standard Deviation	σ DM	DM	't'	'p'
Cardio Respiratory Endurance (CRE)	Pre	2282.0	203.61	19.31	148.51	7.69*	0.01
	Post	2430.6	184.46				
Vital Capacity (VC)	Pre	3.45	0.24	0.06	0.46	8.14*	0.01
	Post	3.91	0.08				
VO_2 Max.	Pre	31.26	3.89	0.17	1.39	7.94*	0.01
	Post	32.65	3.84				
Serum Cholesterol (SC)	Pre	172.20	11.27	1.10	7.35	6.68*	0.01
	Post	164.85	11.49				
High Density Lipoprotein (HDL)	Pre	44.15	3.39	0.34	2.95	8.58*	0.01
	Post	47.10	3.55				
Low Density Lipoprotein (LDL)	Pre	99.00	4.20	0.23	2.85	12.25*	0.01
	Post	96.15	4.02				
Very Low Density Lipoprotein (VLDL)	Pre	19.90	1.36	0.19	0.95	5.14*	0.01
	Post	18.95	0.91				
Triglycerides (TG)	Pre	100.55	7.85	0.24	1.60	6.53*	0.01
	Post	98.95	7.29				
Hand Eye Coordination (HEC)	Pre	23.65	3.75	0.24	2.25	9.41*	0.01
	Post	25.90	3.16				
Leg Eye Coordination (LEC)	Pre	42.95	3.87	0.20	1.55	7.82*	0.01
	Post	44.50	4.27				
Reaction Time (RT)	Pre	2.22	0.40	0.09	0.64	7.43*	0.01
	Post	1.57	0.43				

*Significant difference at 0.05 level of confidence

Table - XI indicates that the obtained ‘t’ ratio on selected physiological variables namely cardio respiratory endurance (CRE), vital capacity (VC) and vo_2 max, bio-chemical variables namely serum cholesterol (SC), high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL) and triglycerides (TG) and psychomotor ability variables namely hand eye coordination (HEC), leg eye coordination (LEC) and reaction time (RT) of asana training group. The obtained’ ratio viz 7.69, 8.14, 7.94, 6.68, 8.58, 12.25, 5.14, 6.53, 9.41, 7.82 and 7.43 were significant. Since the ‘p’ values of all the physiological, bio-chemical and psychomotor ability variables were lesser than 0.05, there were significant improvements between pre and post tests of the selected physiological, bio-chemical, and psychomotor ability variables of college men due to the asana training. And also the results shows that the cardio respiratory endurance was decreased 6.51%, vital capacity was improved 13.33%, VO_2max was improved 4.45%, serum cholesterol was decreased 4.27%, high density lipoprotein (HDL) was improved 6.68%, low density lipoprotein (LDL) was decreased 2.88%, very low density lipoprotein (VLDL) was decreased 4.77%, and triglycerides (TG) was decreased 1.59%, and psychomotor ability variables namely hand eye coordination (HEC) was improved 9.51%,, leg eye coordination (LEC) was improved 3.61% and reaction time (RT) was decreased 28.83%.

TABLE XII

COMPUTATION OF "t" RATIO BETWEEN PRE AND POST TESTS ON PRANAYAMA TRAINING GROUP

Variables	Test	Mean	Standard Deviation	σ DM	DM	't'	'p'
Cardio Respiratory Endurance (CRE)	Pre	2318.3	201.56	19.59	150.18	7.67*	0.01
	Post	2468.5	185.55				
Vital Capacity (VC)	Pre	3.48	0.25	0.06	0.45	7.99*	0.01
	Post	3.93	0.05				
VO_2 Max.	Pre	30.76	3.64	0.28	2.14	7.63*	0.01
	Post	32.90	3.31				
Serum Cholesterol (SC)	Pre	170.60	11.84	1.12	5.65	5.06*	0.01
	Post	164.95	11.74				
High Density Lipoprotein (HDL)	Pre	44.75	3.23	0.31	3.00	9.75*	0.01
	Post	47.75	2.73				
Low Density Lipoprotein (LDL)	Pre	100.95	2.48	0.62	5.90	9.53*	0.01
	Post	95.05	3.22				
Very Low Density Lipoprotein (VLDL)	Pre	19.69	1.25	0.15	1.96	13.18*	0.01
	Post	17.73	1.01				
Triglycerides (TG)	Pre	100.10	6.75	0.66	4.25	6.44*	0.01
	Post	95.85	7.35				
Hand Eye Coordination (HEC)	Pre	21.25	3.60	0.25	4.25	17.00*	0.01
	Post	25.50	3.25				
Leg Eye Coordination (LEC)	Pre	42.85	4.07	0.20	2.20	11.00*	0.01
	Post	45.05	4.19				
Reaction Time (RT)	Pre	2.34	0.34	0.12	0.64	5.29*	0.01
	Post	1.71	0.45				

*Significant difference at 0.05 level of confidence.

Table -XII indicates that the obtained ‘t’ ratio on selected physiological variables namely cardio respiratory endurance (CRE), vital capacity (VC) and VO_2 max. bio-chemical variables namely serum cholesterol (SC), high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL) and Triglycerides (TG) and psychomotor ability variables namely hand eye coordination (HEC), leg eye coordination (LEC) and reaction time (RT) of pranayama training group. The obtained ‘t’ ratios viz 7.67, 7.99, 7.63, 5.06, 9.75, 9.53, 13.18, 6.44, 17.00, 11.00 and 5.29 were significant. Since the ‘p’ values of all the physiological, bio-chemical and psychomotor ability variables were lesser than 0.05, there were significant improvements between pre and post tests of the selected physiological, bio-chemical, and psychomotor ability variables of college men due to the pranayama training. And also the results shows that the cardio respiratory endurance was improved 6.48%, vital capacity was improved 12.93%, VO_2max was improved 6.96%, serum cholesterol was decreased 3.31%, high density lipoprotein (HDL) was improved 6.70%, low density lipoprotein (LDL) was decreased 5.84%, very low density lipoprotein (VLDL) was decreased 9.95%, and Triglycerides (TG) was decreased 4.25%, and psychomotor ability variables namely hand eye coordination (HEC) was improved 20%,, leg eye coordination (LEC) was improved 5.13% and reaction time (RT) was decreased 27.35%.

TABLE XIII

COMPUTATION OF "t" RATIO BETWEEN PRE AND POST TESTS ON SURYANAMASKAR TRAINING GROUP

Variables	Test	Mean	Standard Deviation	σ DM	DM	't'	'p'
Cardio Respiratory Endurance (CRE)	Pre	2298.3	202.78	41.18	190.80	4.63*	0.01
	Post	2489.1	217.50				
Vital Capacity (VC)	Pre	3.36	0.29	0.05	0.39	7.51*	0.01
	Post	3.75	0.16				
VO_2 Max.	Pre	30.49	3.39	0.28	1.43	5.08*	0.01
	Post	31.92	3.82				
Serum Cholesterol (SC)	Pre	169.20	12.60	0.25	3.15	12.39*	0.01
	Post	166.05	12.12				
High Density Lipoprotein(HDL)	Pre	44.50	2.95	0.50	2.85	5.65*	0.01
	Post	47.35	3.44				
Low Density Lipoprotein (LDL)	Pre	99.90	3.89	0.51	6.90	13.60*	0.01
	Post	93.00	3.67				
Very Low Density Lipoprotein (VLDL)	Pre	20.12	1.13	0.21	1.77	8.44*	0.01
	Post	18.35	0.91				
Triglycerides (TG)	Pre	98.20	7.86	0.88	3.80	4.30*	0.01
	Post	94.40	7.12				
Hand Eye Coordination (HEC)	Pre	23.40	3.99	0.43	1.20	2.81*	0.01
	Post	24.60	4.01				
Leg Eye Coordination (LEC)	Pre	43.45	3.86	0.34	4.95	14.72*	0.01
	Post	48.40	3.05				
Reaction Time (RT)	Pre	2.38	0.32	0.07	0.35	5.04*	0.01
	Post	2.03	0.38				

*Significant difference at 0.05 level of confidence.

Table -XIII indicates that the obtained ‘t’ ratio on selected physiological variables namely cardio respiratory endurance (CRE), vital capacity (VC) and vo_2 max, bio-chemical variables namely serum cholesterol (SC), high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL) and Triglycerides (TG) and psychomotor ability variables namely hand eye coordination (HEC), leg eye coordination (LEC) and reaction time (RT) of suryanamaskar training group. The obtained ‘t’ ratios viz 4.63, 7.51, 5.08, 12.39, 5.65, 13.60, 8.44, 4.30, 2.81,14.72 and 5.04 were significant. Since the ‘p’ values of all the physiological, bio-chemical and psychomotor ability variables were lesser than 0.05, there were significant improvements between pre and post tests of the selected physiological, bio-chemical, and psychomotor ability variables of college men due to the suryanamaskar training. And also the results shows that the cardio respiratory endurance was improved 8.31%, vital capacity was improved 11.61%, VO_2max was improved 4.69%, serum cholesterol was decreased 1.86%, high density lipoprotein (HDL) was improved 6.40%, low density lipoprotein (LDL) was decreased 6.91%, very low density lipoprotein (VLDL) was decreased 8.80%, and Triglycerides (TG) was decreased 3.87% and psychomotor ability variables namely hand eye coordination (HEC) was improved 5.13%,, leg eye coordination (LEC) was improved 11.39% and reaction time (RT) was decreased 14.71%.

TABLE XIV

COMPUTATION OF "t" RATIO BETWEEN PRE AND POST TESTS ON CONTROL GROUP

Variables	Test	Mean	Standard Deviation	σ DM	DM	't'	'p'
Cardio Respiratory Endurance (CRE)	Pre	2242.2	169.68	7.06	5.20	0.74	0.47
	Post	2247.4	168.76				
Vital Capacity (VC)	Pre	3.31	0.46	0.04	0.01	0.20	0.85
	Post	3.32	0.44				
VO_2 Max.	Pre	29.67	3.17	0.27	0.10	0.35	0.73
	Post	29.77	3.20				
Serum Cholesterol (SC)	Pre	171.45	11.70	1.13	0.35	0.31	0.76
	Post	171.80	11.30				
High Density Lipoprotein (HDL)	Pre	43.40	3.60	0.60	0.40	0.67	0.51
	Post	43.00	3.43				
Low Density Lipoprotein (LDL)	Pre	99.15	1.95	0.49	0.10	0.20	0.84
	Post	99.05	1.82				
Very Low Density Lipoprotein (VLDL)	Pre	20.60	2.02	0.16	0.28	1.76	0.10
	Post	20.32	1.81				
Triglycerides (TG)	Pre	103.75	9.05	0.63	0.55	0.88	0.39
	Post	103.20	9.11				
Hand Eye Coordination (HEC)	Pre	24.05	4.11	0.22	0.05	0.22	0.83
	Post	24.00	3.85				
Leg Eye Coordination (LEC)	Pre	40.95	1.99	0.36	0.30	0.84	0.41
	Post	41.25	2.10				
Reaction Time (RT)	Pre	2.40	0.33	0.04	0.01	0.26	0.80
	Post	2.41	0.23				

*Significant difference at 0.05 level of confidence.

Table -XIV indicates that the obtained 't' ratio on selected physiological variables namely cardio respiratory endurance (CRE), vital capacity (VC) and vo_2 max, bio-chemical variables namely serum cholesterol (SC), high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL) and Triglycerides (TG) and psychomotor ability variables namely hand eye coordination (HEC), leg eye coordination (LEC) and reaction time (RT) of control group. The obtained ratios viz 0.74, 0.20, 0.35, 0.31, 0.67, 0.20, 1.76, 0.88, 0.22, 0.84 and 0.26 were significant. Since the 'p' values of all the physiological, bio-chemical and psychomotor ability variables were greater than 0.05, hence there were no significant improvements between pre and post tests of the selected physiological, bio-chemical, and psychomotor ability variables of college men.

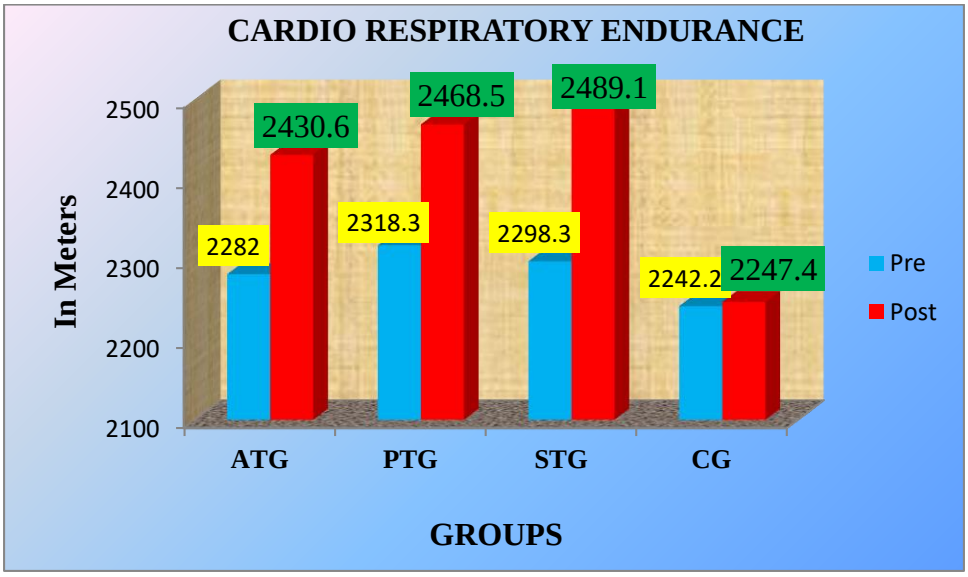


FIGURE 1

FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST TESTS SCORES ON CARDIO REPIRATORY ENDURANCE OF EXPERIMENTAL AND CONTROL GROUPS

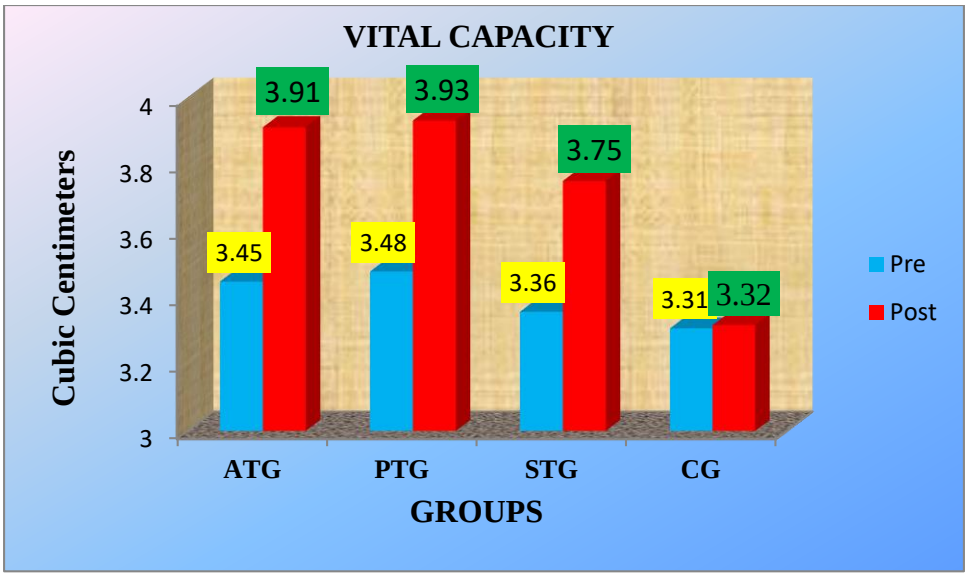


FIGURE 2

FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST TESTS SCORES ON VITAL CAPACITY OF EXPERIMENTAL AND CONTROL GROUPS

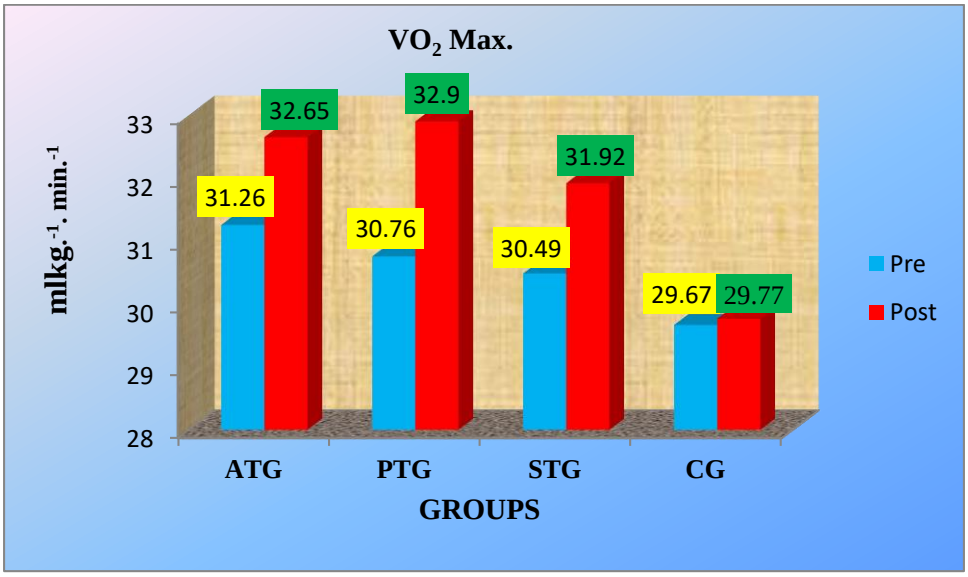


FIGURE 3

FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST TESTS SCORES ON VO_2 MAX. OF EXPERIMENTAL AND CONTROL GROUPS

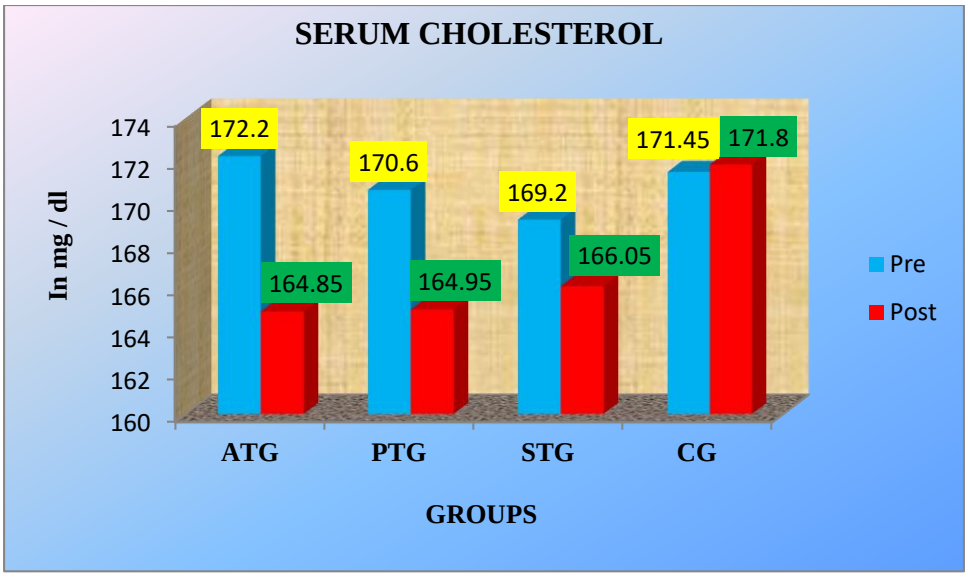


FIGURE 4

FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST TESTS SCORES ON SERUM CHOLESTEROL OF EXPERIMENTAL AND CONTROL GROUPS

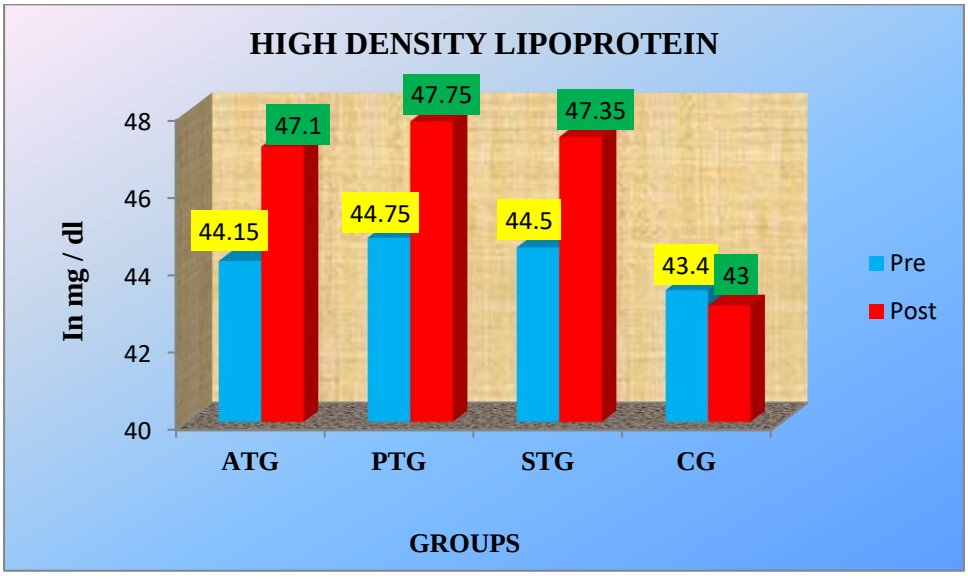


FIGURE 5

FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST TESTS SCORES ON HIGH DENSITY LIPOPROTEIN OF EXPERIMENTAL AND CONTROL GROUPS

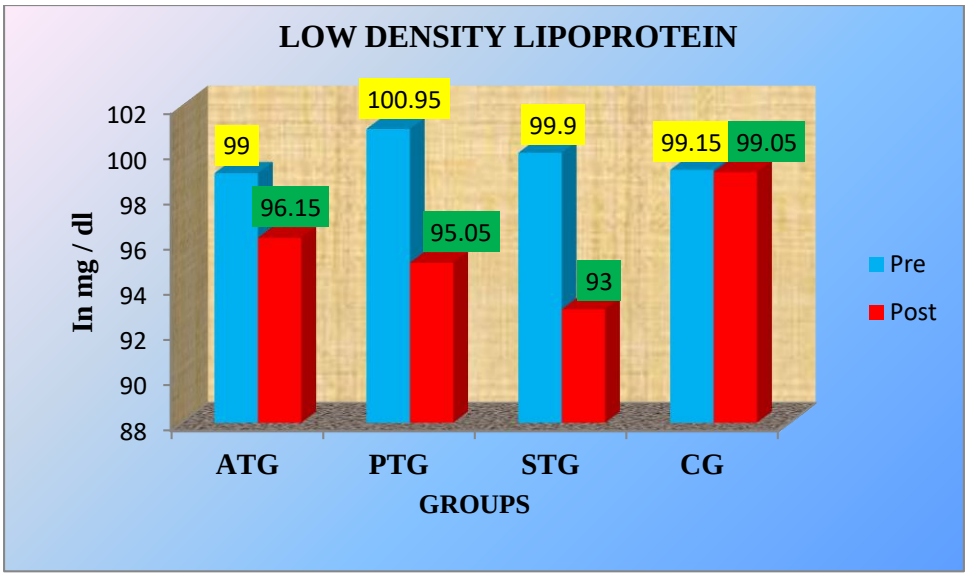


FIGURE 6

FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST TESTS SCORES ON LOW DENSITY LIPOPROTEIN OF EXPERIMENTAL AND CONTROL GROUPS

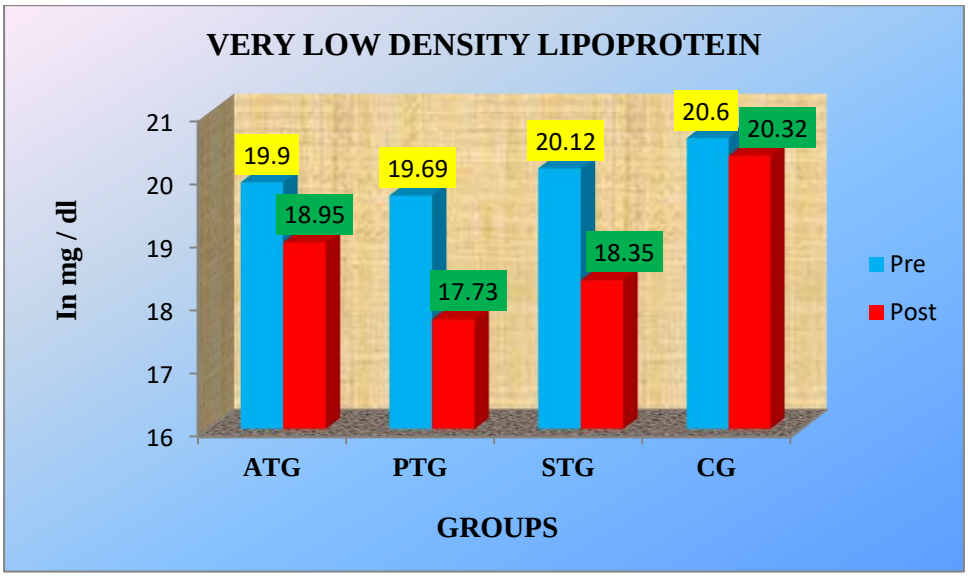


FIGURE 7

FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST TESTS SCORES ON VERY LOW DENSITY LIPOPROTEIN OF EXPERIMENTAL AND CONTROL GROUPS

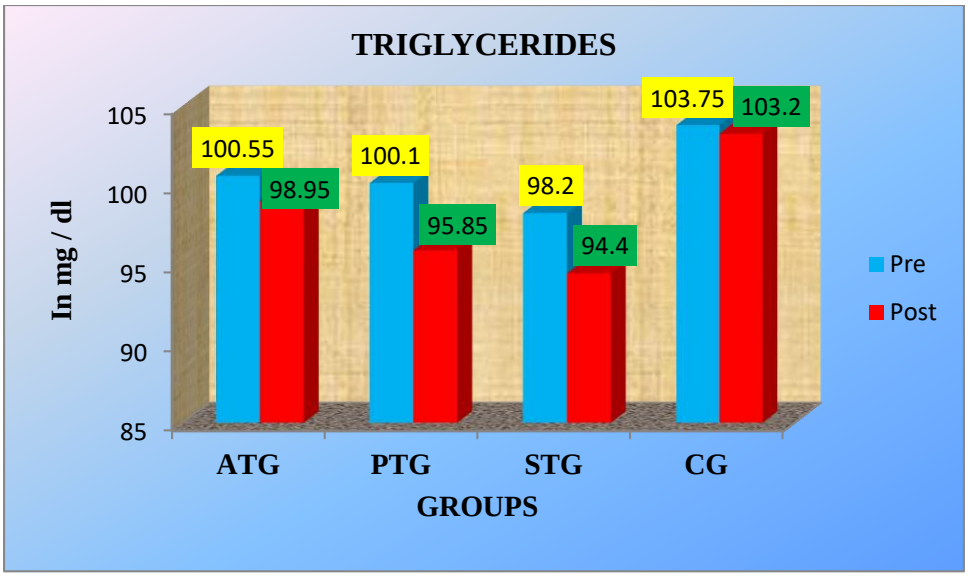


FIGURE 8

FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST TESTS SCORES ON TRIGLYCERIDES OF EXPERIMENTAL AND CONTROL GROUPS

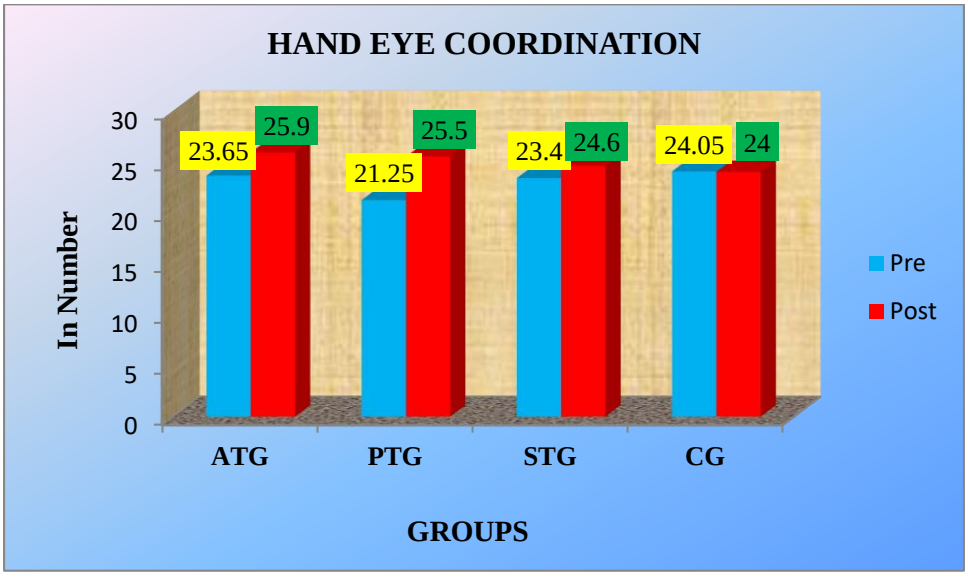


FIGURE 9

FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST TESTS SCORES ON HAND EYE COORDINATION OF EXPERIMENTAL AND CONTROL GROUPS

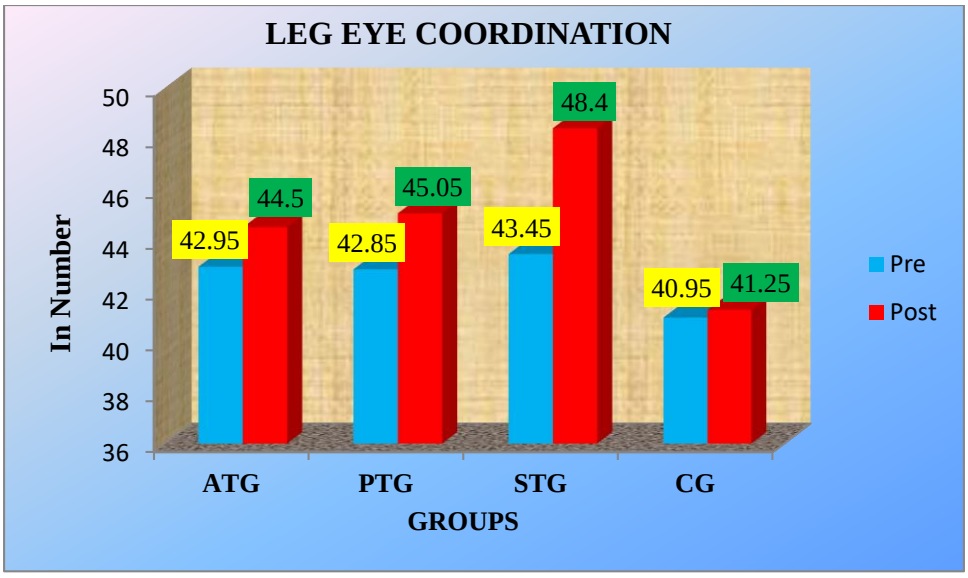


FIGURE 10

FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST TESTS SCORES ON LEG EYE COORDINATION OF EXPERIMENTAL AND CONTROL GROUPS

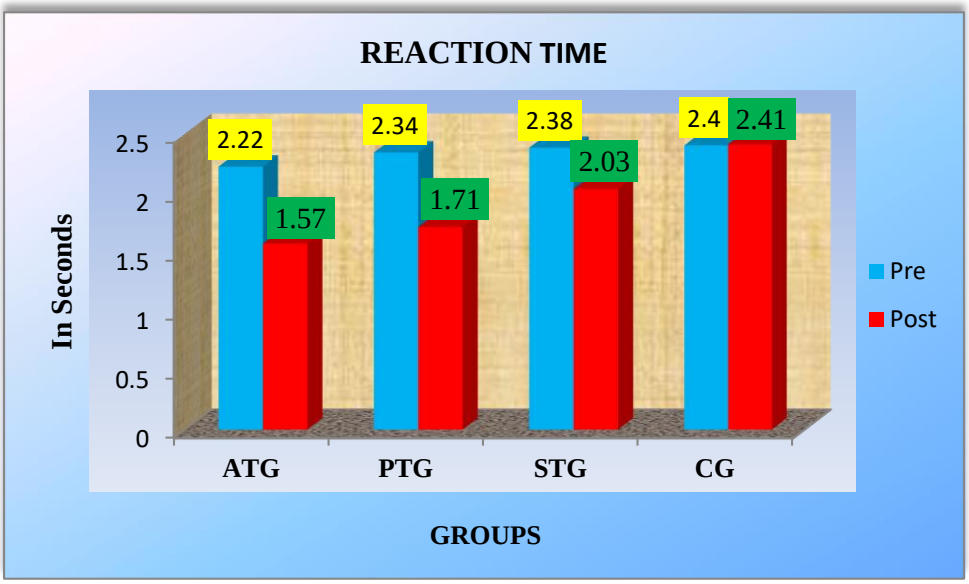


FIGURE 11

FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST TESTS SCORES ON REACTION TIME OF EXPERIMENTAL AND CONTROL GROUPS

4.4 RESULTS ON CARDIO RESPIRATORY ENDURANCE

The physiological variable namely cardio respiratory endurance was measured through 12 mts run / walk test. The results on the efficacy of isolated asana, pranayama and suryanamaskar training and control groups are presented in table -XV.

TABLE XV

COMPUTATION OF ANALYSIS OF COVARIANCE ON CARDIO RESPIRATORY ENDURANCE (In Meters)

Test	Means				Source of Variance	Sum of Square	Degree of Freedom	Mean Square	Obtained 'F' Ratio	'p' value
	AT Group	PT Group	ST Group	Control Group						
Pre Test	2282.0	2318.3	2298.3	2242.2	B	62556.17	3	20852.06	0.55	0.65
					W	2887961.70	76	37999.50		
Post Test	2430.6	2468.5	2489.1	2247.4	B	730610.73	3	243536.91	6.75*	0.01
					W	2740658.96	76	36061.30		
Adjusted Post Test	2433.0	2442.0	2478.0	2282.0	B	443625.32	3	147875.11	13.10*	0.01
					W	846512.62	75	11286.84		
Mean Gain	148.6	150.2	190.8	5.2						

*Significant at 0.05 level of confidence.

Table -XV shows that pre test mean scores of cardio respiratory endurance of asana training group (ATG) was 2282.0, pranayama training group (PTG) was 2318.3, suryanamaskar training group (STG) was 2298.3 and control group (CG) was 2242.2.

The obtained ‘p’ value on pre test score 0.65 was greater than the required ‘p’ value of 0.05 to be significant at 0.05 level. It was proved that there were no significant differences among the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects into groups.

The post - test scores analysis proved that there was a significant difference among the groups, as the obtained ‘p’ value 0.01 was lesser than the 0.05. This proved that there were significant differences among the post test means of all the groups.

Taking into consideration of pre and post tests scores among the groups, the adjusted post test were calculated and subjected to statistical treatment. The obtained ‘p’ value of 0.01 was lesser than the 0.05. This proved that there were significant differences among the means of experimental groups due to the respective experimental trainings on cardio respiratory endurance.

Since the significant differences were recorded, the results were subject to pair - wise comparison among the groups and the results are presented in table-XVI.

TABLE XVI

PAIRED MEAN SIGNIFICANT DIFFERENCE ON CARDIO RESPIRATORY ENDURANCE (In Meters)

Adjusted Post Test Means				Mean Difference	'p' Value
AT Group	PT Group	ST Group	Control Group		
-	-	2478.0	2282.0	196.26*	0.01
-	2442.0	-	2282.0	159.45*	0.01
-	2442.0	2478.0	-	36.81	0.27
2433.0	-	-	2282.0	150.89*	0.01
2433.0	-	2478.0	-	45	0.18
2433.0	2442.0	-	-	9	0.80

*Significant difference at 0.05 level of confidence.

The table -XVI clearly indicates that the paired mean significant difference on the level of cardio respiratory endurance of college men among the experimental and control groups. And the variation in cardio respiratory endurance for college men among the experimental and control groups were found to be significant difference between the paired means of asana training group and control group, pranayama training group and control group and suryanamaskar training group and control group.

However there was no significantly difference between the paired means of asana training group and pranayama training group, asana training group and suryanamaskar training group, and pranayama training group and suryanamaskar training group on cardio respiratory endurance.

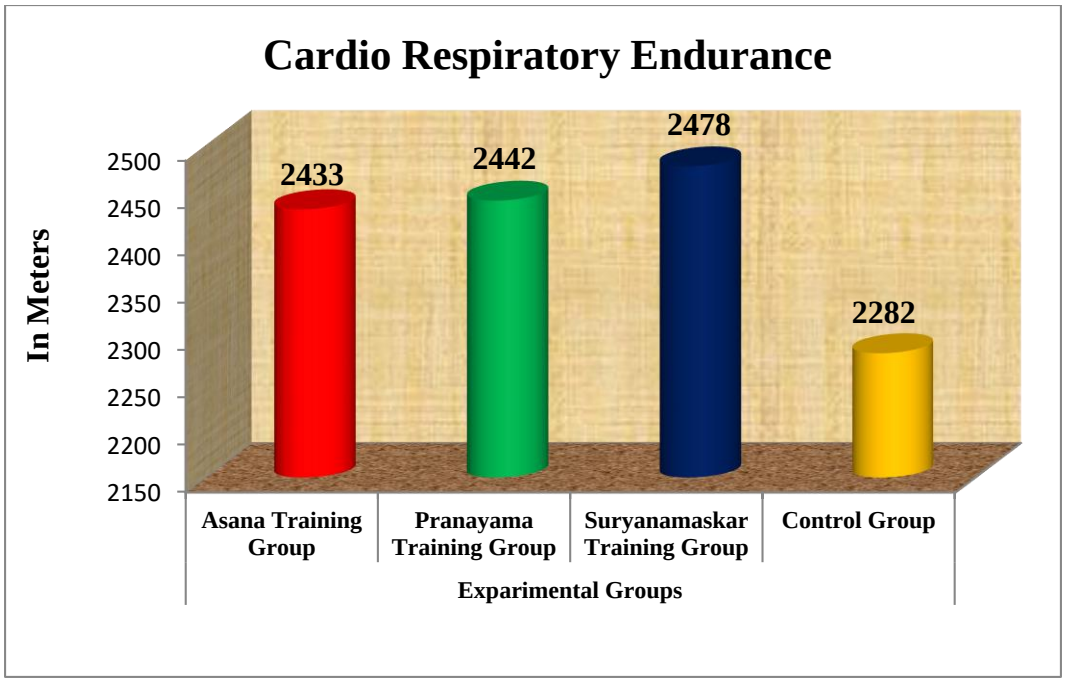


FIGURE 12

FIGURE SHOWING THE ADJUSTED POST TEST MEANS ON CARDIO RESPIRATORY ENDURANCE OF EXPERIMENTAL AND CONTROL GROUPS

4.4.1 Discussion on Findings of Cardio Respiratory Endurance

The results presented in the table -XVI showed that the obtained adjusted post test means on cardio respiratory endurance of asana training group (ATG) was 2433, pranayama training group (PTG) was 2442, suryanamaskar training group (STG) was 2478 and control group (CG) was 2282. The differences among pre test scores, post test scores and adjusted post test mean scores of the subjects were statistically treated by using ANCOVA and 'p' values obtained were 0.65, 0.01 and 0.01 respectively. It was found that the obtained 'p' values on post test scores and adjusted post test mean scores were differ significantly as the obtained 'p' values were lesser than the 'p' value of 0.05.

Probably asana training group (ATG = 6.51%), pranayama training group (PTG = 6.48%) and suryanamaskar training group (STG = 8.31%) would be more effective in causing significant improvement among experimental groups on cardio respiratory endurance. And also when comparing the adjusted post test mean values of cardio respiratory endurance the suryanamaskar training group (STG) had better improvement than the other groups.

While testing the effect of asana (ATG), pranayama (PTG) and suryanamaskar (STG) each one had significantly increased the cardio respiratory endurance of college men. Whereas the control group was concerned the observed mean difference from base line to post test was not differ significantly. Hence it is understood that the selected training means of the respective experimental group had influenced significantly to improve the cardio respiratory endurance.

The results of the study are in consonance with the research done by Himashree G. et al., (2016), Samiran et al., (2012), Harinath K, et al., (2004), Caren Lau et al., (2014), Sinha, et al., (2002), Kunwar Bipin Pratap Bhushan et al., (2017), Sivagami, et al.,(2017), Bhimani et al., (2011), Biswajit Sinha et al., (2014) and Pratima Bhutkar, et al., (2008).

4.5 RESULTS ON VITA CAPACITY

The physiological variable namely vital capacity was measured through wet spiro meter test. The results on the efficacy of isolated asana, pranayama and suryanamaskar training and control groups are presented in table -XVII.

TABLE XVII

COMPUTATION OF ANALYSIS OF COVARIANCE ON VITAL CAPACITY

(Cubic Centimeters)

Test	Means				Source of Variance	Sum of Square	Degree of Freedom	Mean Square	Obtained 'F' Ratio	'p' value
	AT Group	PT Group	ST Group	Control Group						
Pre Test	3.45	3.48	3.36	3.31	**B**	0.37	3	0.12	1.21	0.31
					W	7.77	76	0.10		
Post Test	3.91	3.93	3.75	3.32	**B**	4.87	3	1.63	28.05*	0.01
					W	4.40	76	0.06		
Adjusted Post Test	3.88	3.89	3.77	3.36	**B**	3.56	3	1.19	38.62*	0.01
					W	2.31	75	0.03		
Mean Gain	0.46	0.45	0.39	0.01						

*Significant at 0.05 level of confidence.

The table -XVII shows that pre test mean scores of vital capacity of asana training group (ATG) was 3.45, pranayama training group (PTG) was 3.48, suryanamaskar training group (STG) was 3.36 and control group (CG) was 3.31.

The obtained 'p' value on pre test scores 0.31 was greater than the 0.05 to be significant at 0.05 level. This proved that there were no significant differences among the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects into groups.

The post test scores analysis proved that there was a significant difference among the groups, as the obtained ‘p’ value 0.01was lesser than the 0.05. This proved that there were significant differences among the post test means of all the groups.

Taking into consideration of pre and post tests scores among the groups, the adjusted post test were calculated and subjected to statistical treatment. The obtained ‘p’ value of 0.01 was lesser than the 0.05. This proved that there were significant differences among the means of experimental groups due to the respective experimental trainings on vital capacity.

Since the significant differences were recorded, the results were subjected to pair wise comparison among the groups. The results are presented in table -XVIII.

TABLE XVIII

PAIRED MEAN SIGNIFICANT DIFFERENCE ON VITAL CAPACITY

(Cubic Centimeters)

Adjusted Post Test Means				Mean Difference	‘p’ Value
AT Group	PT Group	ST Group	Control Group		
-	-	3.77	3.36	0.41*	0.01
-	3.89	-	3.36	0.53*	0.01
-	3.89	3.77	-	0.12*	0.03
3.88	-	-	3.36	0.52*	0.01
3.88	-	3.77	-	0.11*	0.04
3.88	3.89	-	-	0.01	0.87

*Significant difference at 0.05 level of confidence.

The table -XVIII clearly indicates that the paired mean significant difference on the level of vital capacity of college men among the experimental and control groups. And the variation in vital capacity for college men among the experimental and control groups were found to be significant difference between the paired means of asana training group and suryanamaskar training group, asana training group and control group, pranayama training group and suryanamaskar training group, pranayama training group and control group and suryanamaskar training group and control group on vital capacity.

However there was no significant difference between the paired means of asana training group and pranayama training group on vital capacity.

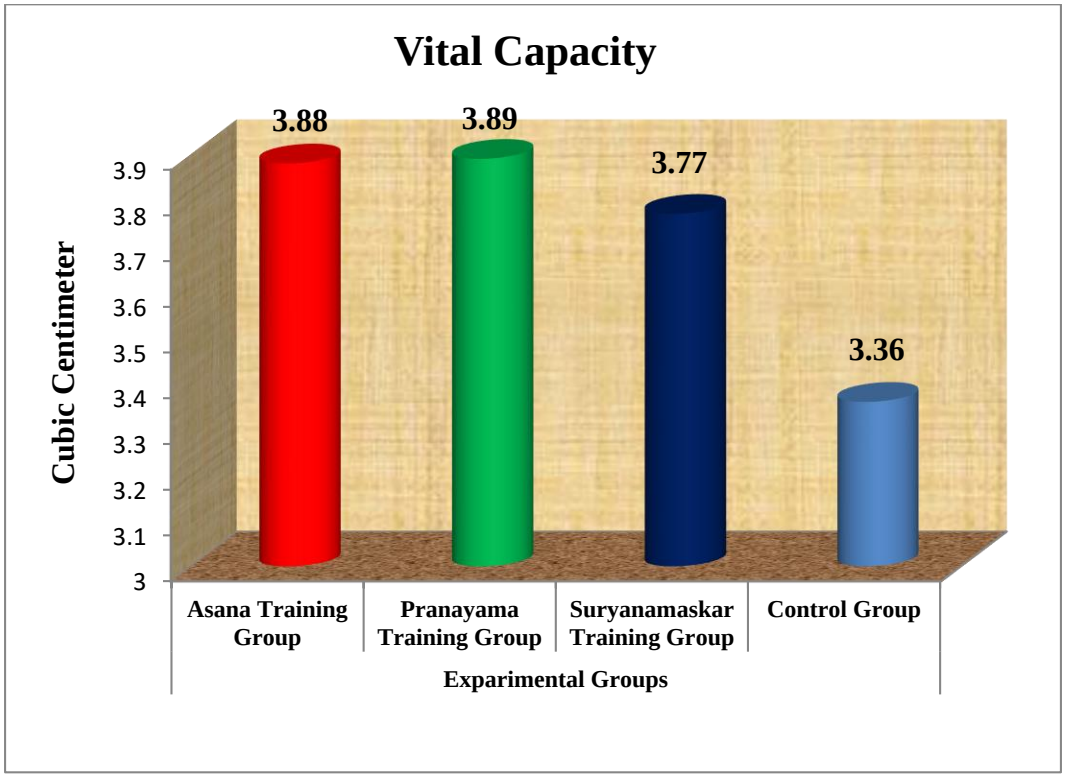


FIGURE 13

FIGURE SHOWING THE ADJUSTED POST TEST MEANS ON VITAL CAPACITY OF EXPARIMENTAL AND CONTROL GROUPS

4.5.1 Discussion on Findings of Vital Capacity

The results presented in the table -XVIII showed that the obtained adjusted post test means on vital capacity of asana training group (ATG) was 3.88, pranayama training group (PTG) was 3.89, suryanamaskar training group (STG) was 3.77 and control group (CG) was 3.36. The differences among pre test scores, post test scores and adjusted post test mean scores of the subjects were statistically treated by using ANCOVA and 'p' values obtained were 0.31, 0.01 and 0.01 respectively. It was found that the obtained 'p' values on post test scores and adjusted post test scores mean scores were differ significantly as the obtained 'p' values were lesser than the 'p' value of 0.05.

Probably asana training group (ATG = 13.33%), pranayama training group (PTG = 12.93%) and suryanamaskar training group (STG = 11.61%) would be more effective in causing significant improvement among experimental groups on vital capacity. And also when comparing the adjusted post test mean values of vital capacity the pranayama training group (PTG) had better improvement than the other groups.

While testing the effect of asana (ATG), pranayama (PTG) and suryanamaskar (STG) each one had significantly increased the vital capacity of college men. Whereas the control group was concerned the observed mean difference from base line to post test was not differ significantly. Hence it is understood that the selected training means of the respective experimental group had influenced significantly to improve the vital capacity.

The result of the study is in consonance with the research done by Mukesh Kumar Mishra et al., (2015), Kaushik Halder and Abhirup Chatterjee, et al., (2012), Karthik et al., (2014), Shyam karthik et al., (2014), Sukhdev Singh et al., (2011), Baljinder Singh Bal et al., (2010) and Subbalakshmi et al., (2005).

4.6 RESULTS ON VO_2 MAX.

The physiological variable namely VO_2 Max. was measured through step test. The results on the efficacy of isolated asana, pranayama and suryanamaskar training and control groups are presented in table -XIX.

TABLE XIX

COMPUTATION OF ANALYSIS OF COVARIANCE ON VO_2 Max.

(ml.kg.$^{-1}$ min.$^{-1}$)

Test	Means				Source of Variance	Sum of Square	Degree of Freedom	Mean Square	Obtained 'F' Ratio	'p' value
	AT Group	PT Group	ST Group	Control Group						
Pre Test	31.26	30.76	30.49	29.67	B	26.50	3	8.83	0.71	0.55
					W	949.48	76	12.49		
Post Test	32.65	32.90	31.92	29.77	B	121.33	3	40.44	3.20*	0.03
					W	959.32	76	12.62		
Adjusted Post Test	31.97	32.70	31.97	30.60	B	45.17	3	15.06	11.64	0.01
					W	96.99	75	1.29		
Mean Gain	1.39	2.14	1.43	0.1						

*Significant at 0.05 level of confidence.

The table -XIX shows that pre test mean scores of VO_2 Max. of asana training group (ATG) was 31.26, pranayama training group (PTG) was 30.76, suryanamaskar training group (STG) was 30.49 and control group (CG) was 29.67.

The obtained ‘p’ value on pre test scores 0.55 was greater than the 0.05 to be significant at 0.05 level. This proved that there were no significant differences among the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects into groups.

The post test scores analysis proved that there was a significant difference among the groups, as the obtained ‘p’ value 0.02 was lesser than the 0.05. This proved that there were significant differences among the post test means of all the groups.

Taking into consideration of pre and post tests scores among the groups, the adjusted post test were calculated and subjected to statistical treatment. The obtained ‘p’ value of 0.01 was lesser than the 0.05. This proved that there were significant differences among the adjusted post test means of experimental groups due to the respective experimental trainings on VO_2 Max.

Since the significant differences were recorded, the results were subjected to pair wise comparison among the groups. The results are presented in table -XX.

TABLE XX

PAIRED MEAN SIGNIFICANT DIFFERENCE ON VO_2 MAX.

(ml.kg.$^{-1}$ min.$^{-1}$)

Adjusted Post Test Means				Mean Difference	'p' Value
AT Group	PT Group	ST Group	Control Group		
-	-	31.97	30.60	1.37*	0.01
-	32.70	-	30.60	2.09*	0.01
-	32.70	31.97	-	0.72*	0.04
31.97	-	-	30.60	1.37*	0.01
31.97	-	31.97	-	0.01	0.99
31.97	32.70	-	-	0.73*	0.04

*Significant difference at 0.05 level of confidence.

The table -XX clearly indicates that the paired mean significant difference on the level of VO_2 Max. of college men among the experimental and control groups and the variation in VO_2 Max. for college men among the experimental and control groups were found to be significant difference between the paired means of asana training group and pranayama training group, asana training group and control group, pranayama training group and suryanamaskar training group, pranayama training group and control group and suryanamaskar training group and control group on VO_2 Max.

However, there was no significant between the paired means of asana training group and suryanamaskar training group on VO_2 Max.

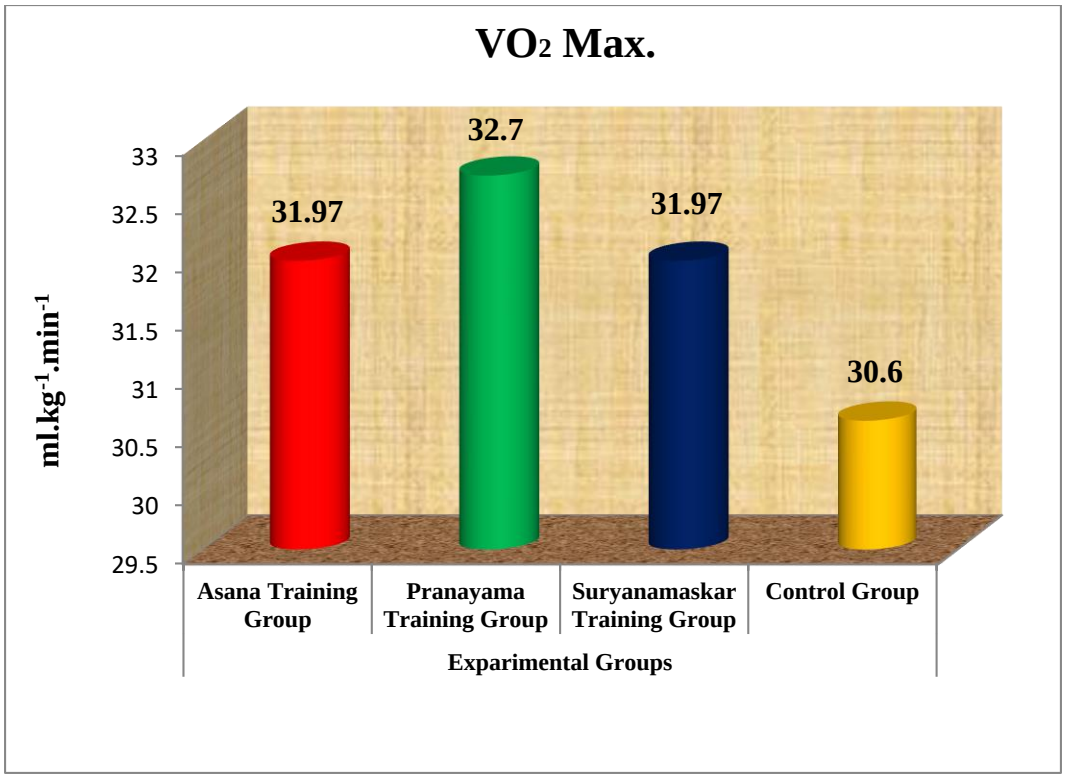


FIGURE 14

FIGURE SHOWING THE ADJUSTED POST TEST MEANS ON VO_2 Max. OF EXPERIMENTAL AND CONTROL GROUPS

4.6.1 Discussion on Findings of VO_2 Max.

The results presented in the table –XX showed that the obtained adjusted post test means on vital capacity of asana training group (ATG) was 31.97, pranayama training group (PTG) was 32.7, suryanamaskar training group (STG) was 31.97 and control group (CG) was 30.6. The differences among pre test scores, post test scores and adjusted post test mean scores of the subjects were statistically treated by using ANCOVA and 'p' values obtained were 0.55, 0.03 and 0.01 respectively. It was found that the obtained 'p' values on post test scores and adjusted post test means score were significantly differ as the obtained 'p' values were lesser than the required 'p' value of 0.05.

Probably asana training group (ATG = 4.45%), pranayama training group (PTG = 6.96%) and suryanamaskar training group (STG = 4.69%) would be more effective in causing significant improvement among experimental groups on VO_2 Max. and also when comparing the adjusted post test mean values of VO_2 Max. the pranayama group (PTG) had better improvement than the other groups.

While testing the effect of asana (ATG), pranayama (PTG) and suryanamaskar (STG) each one had significantly increased the VO_2 Max of college men. Whereas the control group was concerned the observed mean difference from base line to post test was not differ significantly. Hence it is understood that the selected training means of the respective experimental group had influenced significantly to improve the VO_2 Max.

The result of the study is in consonance with the research done by Palpandi and Radhakrishnan., et al., (2016).

4.7 RESULTS ON SERUM CHOLESTROL

The bio-chemical variable namely serum cholesterol was measured through lab test. The results on the efficacy of isolated asana, pranayama and suryanamaskar training and control groups are presented in table -XXI.

TABLE XXI

COMPUTATION OF ANALYSIS OF COVARIANCE ON SERUM CHOLESTEROL (In mg / dl)

Test	Means				Source of Variance	Sum of Square	Degree of Freedom	Mean Square	Obtained 'F' Ratio	'p' value
	AT Group	PT Group	ST Group	Control Group						
Pre Test	172.20	170.60	169.20	171.45	B	99.34	3	33.11	0.24	0.87
					W	10696.15	76	140.74		
Post Test	164.85	164.95	166.05	171.80	B	654.74	3	218.25	1.60	0.20
					W	10345.65	76	136.13		
Adjusted Post Test	163.60	165.20	167.60	171.30	B	662.32	3	220.77	12.10*	0.01
					W	1368.92	75	18.25		
Mean Gain	7.35	5.65	3.15	0.35						

*Significant at 0.05 level of confidence.

Table - XXI shows that pre test mean scores of serum cholesterol of asana training group (ATG) was 172.20, pranayama training group (PTG) was 170.60, suryanamaskar training group (STG) was 169.20and control group (CG) was 171.45.

The obtained ‘p’ value on pre test scores 0.87 was greater than the 0.05 to be significant at 0.05 level. This proved that there were no significant differences among the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects into groups.

The post test scores analysis proved that there was a significant difference among the groups, as the obtained ‘p’ value 0.20 was greater than the required ‘p’ value of 0.05. This proved that there were no significant differences among the post test means of all the groups.

Taking into consideration of pre and post tests scores among the groups, the adjusted post test were calculated and subjected to statistical treatment. The obtained ‘p’ value of 0.01 was lesser than the 0.05. This proved that there were significant differences among the adjusted post test means of experimental groups due to the respective experimental trainings on serum cholesterol.

Since the significant differences were recorded, the results were subjected to pair wise comparison among the groups. The results are presented in table -XXII.

TABLE XXII

PAIRED MEAN SIGNIFICANT DIFFERENCE ON SERUM CHOLESTEROL

(In mg / dl)

Adjusted Post Test Means				Mean Difference	'p' Value
AT Group	PT Group	ST Group	Control Group		
-	-	167.60	171.30	3.69*	0.01
-	165.20	-	171.30	6.07*	0.01
-	165.20	167.60	-	2.38	0.08
163.60	-	-	171.30	7.64*	0.01
163.60	-	167.60	-	3.95*	0.01
163.60	165.20	-	-	1.57	0.25

*Significant difference at 0.05 level of confidence.

The table -XXII clearly indicates that the paired mean significant difference on the level of serum cholesterol of college men among the experimental and control groups. And the variation in serum cholesterol for college men among the experimental and control groups were found to be significant difference between the paired means of asana training group and suryanamaskar training group, asana training group and control group, pranayama training group and control group and suryanamaskar training group and control group on serum cholesterol.

However, there were no significant difference between the paired means of asana training group and pranayama training group and pranayama training group and suryanamaskar training group on serum cholesterol.

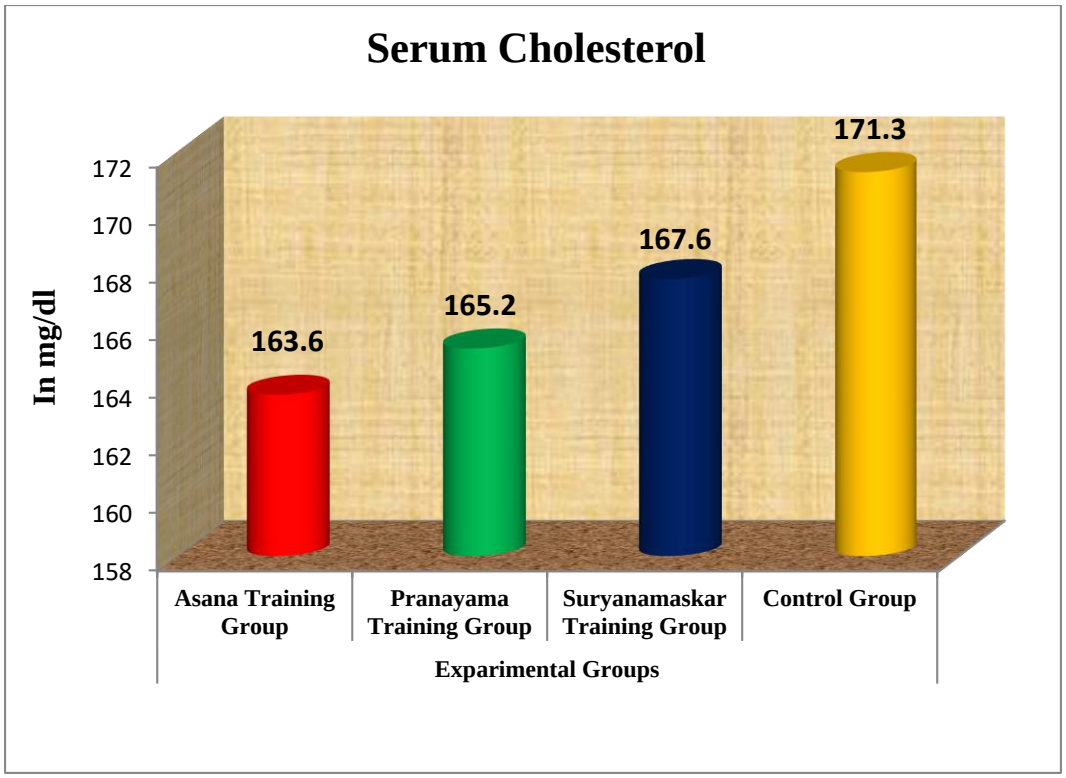


FIGURE 15

FIGURE SHOWING THE ADJUSTED POST TEST MEANS ON SERUM CHOLESTEROL OF EXPERIMENTAL AND CONTROL GROUPS

4.7.1 Discussion on Findings of Serum Cholesterol

The results presented in the table -XXII showed that the obtained adjusted post test means on serum cholesterol of asana training group (ATG) was 163.60, pranayama training group (PTG) was 165.20, suryanamaskar training group (STG) was 167.60 and control group (CG) was 171.30. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated by using ANCOVA and 'p' values obtained were 0.87, 0.20, and 0.01 respectively. It was found that the obtained 'p' values on post test scores and adjusted post test means were differ significantly as the obtained 'p' values were lesser than the 'p' value of 0.05.

Probably asana training group (ATG = 4.27%), pranayama training group (PTG = 3.31%) and suryanamaskar training group (STG = 1.86%) would be more effective in causing significant reduction among experimental groups on serum cholesterol. And also when comparing the adjusted post test mean values of serum cholesterol the asana training group (ATG) had showed better reduction improvement than the other groups.

While testing the effect of asana (ATG), pranayama (PTG) and suryanamaskar (STG) each one had significantly decreased the serum cholesterol of college men. Whereas the control group was concerned the observed mean difference from base line to post test was not differ significantly. Hence it is understood that the selected training means of the respective experimental group had influenced significantly to decrease the serum cholesterol.

The result of the study is in consonance with the research done by Acharya, et al., (2010), Krzysztof Stec et al., (2017) and Subhash Dadhe et al., 1992).

4.8 RESULTS ON HIGH DENISITY LIPOPROTEIN

The bio-chemical variable namely high density lipoprotein was measured through lab test. The results on the efficacy of isolated asana, pranayama and suryanamaskar training and control groups are presented in table -XXIII.

TABLE XXIII

COMPUTATION OF ANALYSIS OF COVARIANCE ON HIGH DENSITY LIPOPROTEIN (In mg / dl)

Test	Means				Source of Variance	Sum of Square	Degree of Freedom	Mean Square	Obtained 'F' Ratio	'p' value
	AT Group	PT Group	ST Group	Control Group						
Pre Test	44.15	44.75	44.50	43.40	**B**	20.70	3	6.90	0.63	0.59
					W	828.10	76	10.90		
Post Test	47.10	47.75	47.35	43.00	**B**	294.70	3	98.23	8.99*	0.01
					W	830.10	76	10.92		
Adjusted Post Test	47.14	47.30	47.11	43.65	**B**	183.94	3	61.31	16.14*	0.01
					W	284.86	75	3.80		
Mean Gain	2.95	3	2.85	0.4						

*Significant at 0.05 level of confidence.

The table -XXIII shows that pre test mean scores of high density lipoprotein of asana training group (ATG) was 44.15, pranayama training group (PTG) was 44.75, suryanamaskar training group (STG) was 44.50 and control group (CG) was 43.40.

The obtained ‘p’ value on pre test scores 0.59 was greater than the 0.05 to be significant at 0.05 level. This proved that there were no significant differences among the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects into groups.

The post test scores analysis proved that there was a significant difference among the groups, as the obtained ‘p’ value 0.01 was lesser than the 0.05. This proved that there were significant differences among the post test means of all the groups.

Taking into consideration of pre and post tests scores among the groups, the adjusted post test were calculated and subjected to statistical treatment. The obtained ‘p’ value of 0.01 was lesser than the 0.05. This proved that there were significant differences among the adjusted post test means of experimental groups due to the respective experimental trainings on high density lipoprotein.

Since the significant differences were recorded, the results were subjected to pair wise comparison among the groups. The results are presented in table -XXIV.

TABLE XXIV

PAIRED MEAN SIGNIFICANT DIFFERENCE ON HIGH DENSITY LIPOPROTEIN (In mg / dl)

Adjusted Post Test Means				Mean Difference	'p' Value
AT Group	PT Group	ST Group	Control Group		
-	-	47.11	43.65	3.46*	0.01
-	47.30	-	43.65	3.66*	0.01
-	47.30	47.11	-	0.19	0.75
47.14	-	-	43.65	3.49*	0.01
47.14	-	47.11	-	0.03	0.96
47.14	47.30	-	-	0.16	0.79

*Significant difference at 0.05 level of confidence.

The table -XXIV clearly indicates that the paired mean significant difference on the level of high density lipoprotein of college men among the experimental and control groups. And the variation in high density lipoprotein for college men among the experimental and control groups were found to be significant difference between the paired means of asana training group and control group, pranayama training group and control group and suryanamaskar training group and control group on high density lipoprotein.

However, there were no significant between the paired mean of asana training group and pranayama training group, asana training group and suryanamaskar training group and pranayama training group and suryanamaskar training group on high density lipoprotein.

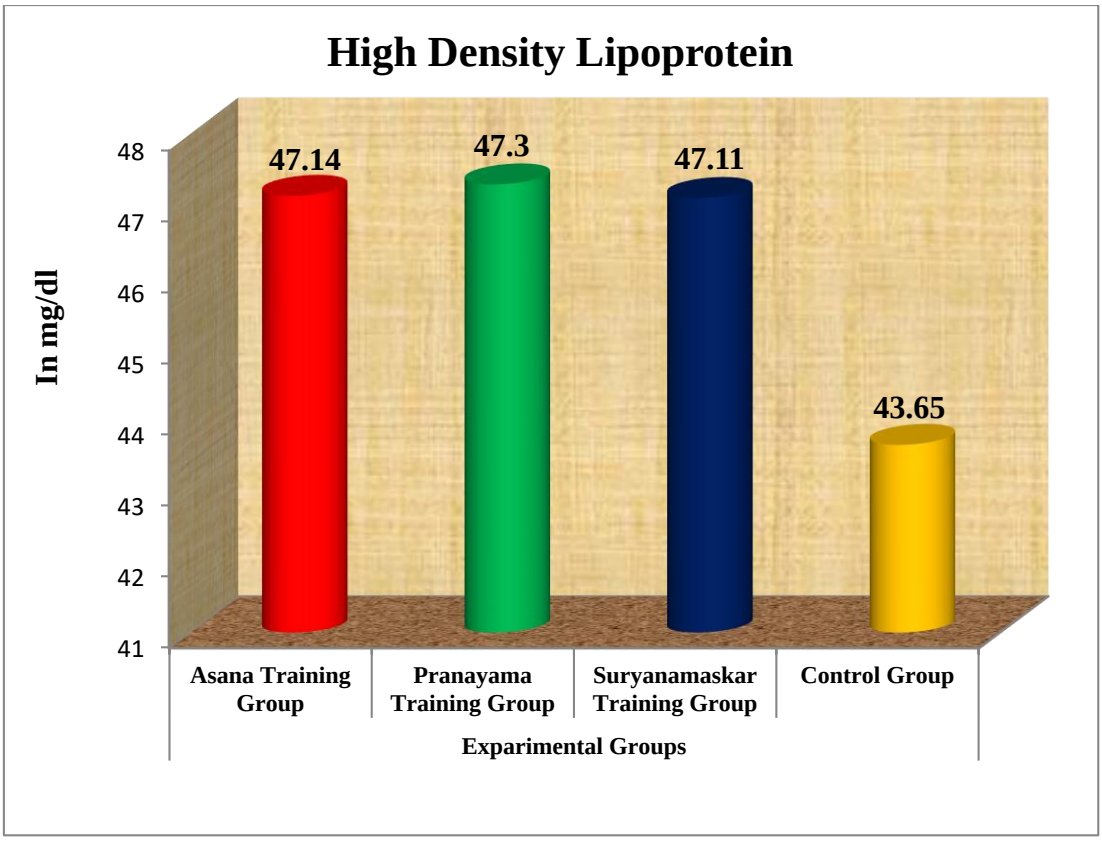


FIGURE 16

FIGURE SHOWING THE ADJUSTED POST TEST MEANS ON HIGH DENSITY LIPOPROTEIN OF EXPERIMENTAL AND CONTROL GROUPS

4.8.1 Discussion on Findings of High Density Lipoprotein

The results presented in the table -XXIV showed that the obtained adjusted post test means on high density lipoprotein of asana training group (ATG) was 47.14, pranayama training group (PTG) was 47.3, suryanamaskar training group (STG) was 47.11and control group (CG) was 43.65. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated by using ANCOVA and 'p' values obtained were 0.59, 0.01, and 0.01 respectively. It was found that the obtained 'p' values on post test scores and adjusted post test scores mean scores were differ significantly as the obtained 'p' values were lesser than the 'p' value of 0.05.

Probably asana training group (ATG = 6.68%), pranayama training group (PTG = 6.70%) and suryanamaskar training group (STG = 6.40%) would be more effective in causing significant improvement among experimental groups on high density lipoprotein. And also when comparing the adjusted post test mean values of high density lipoprotein the pranayama training group (PTG) had better improvement than the other groups.

While testing the effect of asana (ATG), pranayama (PTG) and suryanamaskar (STG) each one had significantly increased the high density lipoprotein of college men. Whereas the control group was concerned the observed mean difference from base line to post test was not differ significantly. Hence it is understood that the selected training means of the respective experimental group had influenced significantly to improve the high density lipoprotein.

The result of the study is in consonance with the research done by Krzysztof Stec et al., (2017), Shenbagavalli et al., (2010), Subhash Dadhe et al., (1992) and Anjum Sayyed et al., (2010).

4.9 RESULTS ON LOW DENSITY LIPOPROTEIN

The bio-chemical variable namely low density lipoprotein was measured through lab test. The results on the efficacy of isolated asana, pranayama and suryanamaskar training and control groups are presented in table -XXV.

TABLE XXV

COMPUTATION OF ANALYSIS OF COVARIANCE ON LOW DENSITY LIPOPROTEIN (In mg / dl)

Test	Means				Source of Variance	Sum of Square	Degree of Freedom	Mean Square	Obtained 'F' Ratio	'p' value
	AT Group	PT Group	ST Group	Control Group						
Pre Test	99.00	100.95	99.90	99.15	**B**	47.70	3	15.90	1.48	0.22
					W	811.30	76	10.67		
Post Test	96.15	95.05	93.00	99.05	**B**	381.73	3	127.25	11.73*	0.01
					W	824.45	76	10.85		
Adjusted Post Test	96.74	94.10	92.88	99.52	**B**	509.21	3	169.74	39.82*	0.01
					W	319.74	75	4.26		
Mean Gain	2.7	6.2	4.75	0.55						

*Significant at 0.05 level of confidence.

The table -XXV shows that pre test mean scores of low density lipoprotein of asana training group (ATG) was 99.00, pranayama training group (PTG) was 100.95, suryanamaskar training group (STG) was 99.90 and control group (CG) was 99.15.

The obtained ‘p’ value on pre test scores 0.22 was greater than the 0.05 to be significant at 0.05 level. This proved that there were no significant differences among the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects into groups.

The post test scores analysis proved that there were a significant difference among the groups, as the obtained ‘p’ value 0.01 was lesser than the 0.05. This proved that there were significant differences among the post test means of all the groups.

Taking into consideration of pre and post tests scores among the groups, the adjusted post test were calculated and subjected to statistical treatment. The obtained ‘p’ value of 0.01 was lesser than the 0.05. This proved that there was significant difference among the adjusted post test means of experimental groups due to the respective experimental trainings on low density lipoprotein.

Since the significant differences were recorded, the results were subjected to pair wise comparison among the groups. The results are presented in table -XXVI.

TABLE XXVI

PAIRED MEAN SIGNIFICANT DIFFERENCE ON LOW DENSITY LIPOPROTEIN (In mg / dl)

Adjusted Post Test Means				Mean Difference	'p' Value
AT Group	PT Group	ST Group	Control Group		
-	-	92.88	99.52	6.64*	0.01
-	94.10	-	99.52	5.42*	0.01
-	94.10	92.88	-	1.22	0.06
96.74	-	-	99.52	2.78*	0.01
96.74	-	92.88	-	3.86*	0.01
96.74	94.10	-	-	2.64*	0.01

*Significant difference at 0.05 level of confidence.

The table -XXVI clearly indicates that the paired mean significant difference on the level of low density lipoprotein of college men among the experimental and control groups. And the variation in low density lipoprotein for college men among the experimental and control groups were found to be significant difference between the paired means of asana training group and pranayama training group, asana training group and suryanamaskar training group, asana training group and control group, pranayama training group and control group and suryanamaskar training group and control group on low density lipoprotein.

However, there was no significant difference between the paired means of pranayama training group and suryanamaskar training group on low density lipoprotein.

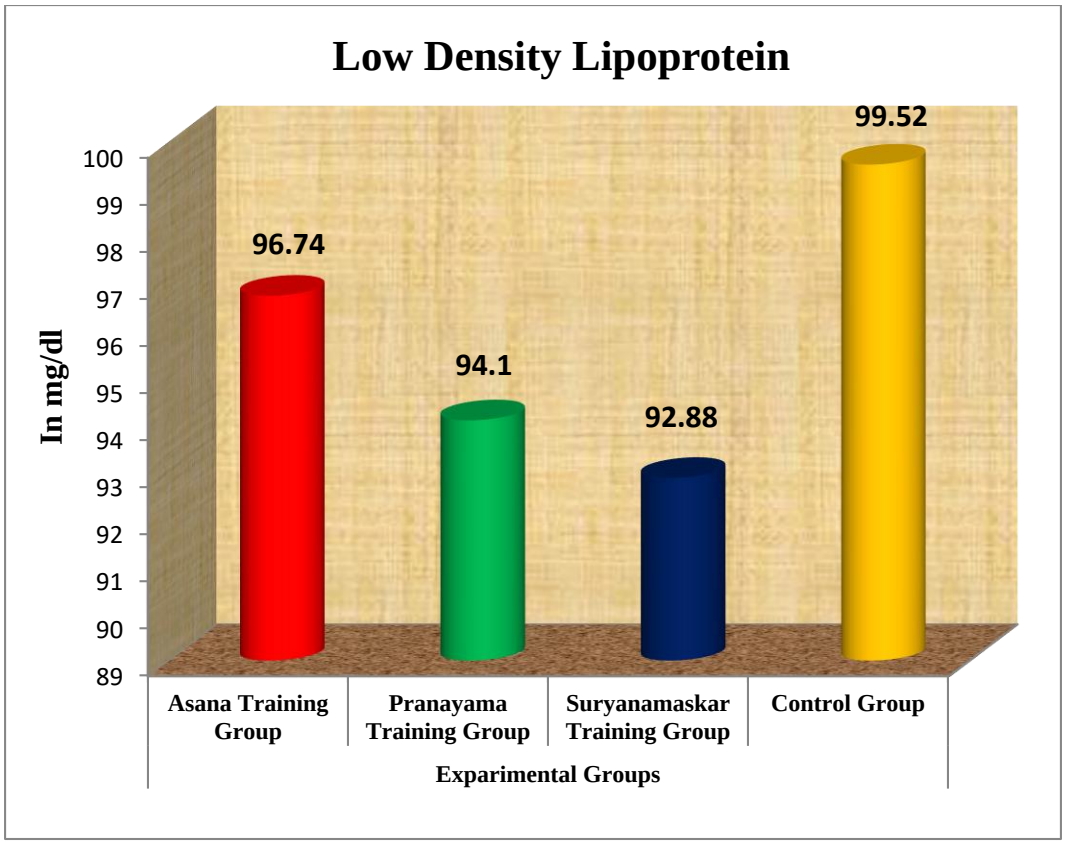


FIGURE 17

FIGURE SHOWING THE ADJUSTED POST TEST MEANS ON LOW DENSITY LIPOPROTEIN OF EXPERIMENTAL AND CONTROL GROUPS

4.9.1 Discussion on Findings of Low Density Lipoprotein

The results presented in the table -XXVI showed that the obtained adjusted post test means on low density lipoprotein of asana training group (TG) was 96.74, pranayama training group (PTG) was 94.10, suryanamaskar training group (STG) was 92.88 and control group (CG) was 99.52. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated by using ANCOVA and 'p' values obtained were 0.22, 0.01 and 0.01 respectively. It was found

that the obtained ‘p’ values on post test scores and adjusted post test mean scores were significantly differ as the obtained ‘p’ values were lesser than the required ‘p’ value of 0.05.

Probably asana training group (ATG = 2.88%), pranayama training group (PTG = 5.84%) and suryanamaskar training group (STG = 6.91%) would be more effective in causing significant reduction among experimental groups on low density lipoprotein. And also when comparing the adjusted post test mean values of low density lipoprotein the suryanamaskar training group (STG) had showed better reduction than the other groups.

While testing the effect of asana (ATG), pranayama (PTG) and suryanamaskar (STG) each one had significantly decreased the low density lipoprotein of college men. Whereas the control group was concerned the observed mean difference from base line to post test was not differ significantly. Hence it is understood that the selected training means of the respective experimental group had influenced significantly to decrease the low density lipoprotein.

The result of the study is in consonance with the research done by Krzysztof Stec et al., (2017), Shenbagavalli et al., (2010), Anjum Sayyed et al., (2010) and Subhash Dadhe et al., (1992).

4.10 RESULTS ON VERY LOW DENSITY LIPOPROTEIN

The bio-chemical variable namely very low density lipoprotein was measured through lab test. The results on the efficacy of isolated asana, pranayama and suryanamaskar training and control groups are presented in table -XXVII.

TABLE XXVII

COMPUTATION OF ANALYSIS OF COVARIANCE ON VERY LOW DENSITY LIPOPROTEIN (In mg / dl)

Test	Means				Source of Variance	Sum of Square	Degree of Freedom	Mean Square	Obtained 'F' Ratio	'p' value
	AT Group	PT Group	ST Group	Control Group						
Pre Test	19.90	19.69	20.12	20.60	**B**	9.21	3	3.07	1.41	0.25
					W	166.00	76	2.18		
Post Test	18.95	17.73	18.35	20.32	**B**	73.65	3	24.55	16.47*	0.01
					W	113.26	76	1.49		
Adjusted Post Test	19.07	18.00	18.32	19.96	**B**	43.80	3	14.60	33.61*	0.01
					W	32.58	75	0.43		
Mean Gain	0.95	1.96	1.77	0.28						

*Significant at 0.05 level of confidence.

The table -XXVII shows that pre test mean scores of very low density lipoprotein of asana training group (ATG) was 19.90, pranayama training group (PTG) was 19.69, suryanamaskar training group (STG) was 20.12 and control group (CG) was 20.60.

The obtained ‘p’ value on pre test scores 0.25was greater than the 0.05 to be significant at 0.05 level. This proved that there were no significant differences among the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects into groups.

The post test scores analysis proved that there was a significant difference among the groups, as the obtained ‘p’ value 0.01 was lesser than the 0.05. This proved that there were significant differences among the post test means of all the groups.

Taking into consideration of pre and post tests scores among the groups, the adjusted post test were calculated and subjected to statistical treatment. The obtained ‘p’ value of 0.01 was lesser than the 0.05. This proved that there were significant differences among the adjusted post test means of experimental groups due to the respective experimental trainings on very low density lipoprotein.

Since the significant differences were recorded, the results were subjected to pair wise comparison among the groups. The results are presented in table -XXVIII.

TABLE XXVIII

PAIRED MEAN SIGNIFICANT DIFFERENCE ON VERY LOW DENSITY LIPOPROTEIN (In mg / dl)

Adjusted Post Test Means				Mean Difference	'p' Value
AT Group	PT Group	ST Group	Control Group		
-	-	18.32	19.96	1.64*	0.01
-	18.00	-	19.96	1.96*	0.01
-	18.00	18.32	-	0.32	0.13
19.07	-	-	19.96	0.89*	0.01
19.07	-	18.32	-	0.75*	0.01
19.07	18.00	-	-	1.07*	0.01

*Significant difference at 0.05 level of confidence.

The table -XXVIII clearly indicates that the paired mean significant difference on the level of very low density lipoprotein of college men among the experimental and control groups. And the variation in very low density lipoprotein for college men among the experimental and control groups were found to be significant difference between the paired means of asana training group and pranayama training group, asana training group and suryanamaskar training group, asana training group and control group, pranayama training group and control group and suryanamaskar training group and control group on very low density lipoprotein.

However, there was no significant between the paired means pranayama training group and suryanamaskar training group on very low density lipoprotein.

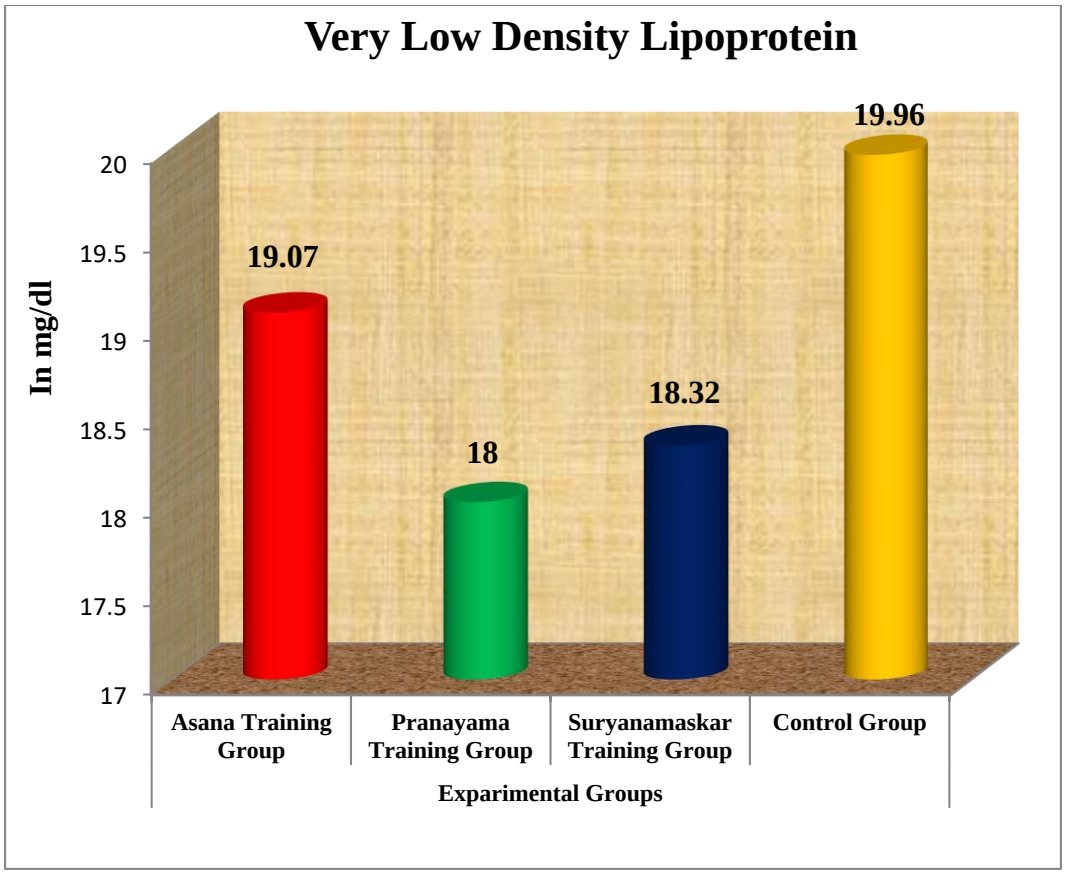


FIGURE 18

FIGURE SHOWING THE ADJUSTED POST TEST MEANS ON VERY LOW DENSITY LIPOPROTEIN OF EXPERIMENTAL AND CONTROL GROUPS

4.10.1 Discussion on Findings of Very Low Density Lipoprotein

The results presented in the table -XXVIII showed that the obtained adjusted post test means on very low density lipoprotein of asana training group (ATG) was 19.07, pranayama training group (PTG) was 18.00, suryanamaskar training group (STG) was 18.32 and control group (CG) was 19.96. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated by using ANCOVA and 'p' values obtained were 0.25, 0.01 and 0.01 respectively. It was found

that the obtained ‘p’ values on post test scores and adjusted post test mean scores were significantly differ as the obtained ‘p’ values were lesser than the ‘p’ value of 0.05.

Probably asana training group (ATG = 4.77%), pranayama training group (PTG = 9.95%) and suryanamaskar training group (STG = 8.80%) would be more effective in causing significant reduction among experimental groups on very low density lipoprotein. And also when comparing the adjusted post test mean values of very low density lipoprotein the pranayama training group (PTG) had showed reduction than the other groups.

While testing the effect of asana (ATG), pranayama (PTG) and suryanamaskar (STG) each one had significantly decreased the very low density lipoprotein of college men. Whereas the control group was concerned the observed mean difference from base line to post test was not differ significantly. Hence it is understood that the selected training means of the respective experimental group had influenced significantly to decrease the very low density lipoprotein.

The result of the study is in consonance with the research done by Acharya, et al., (2010) and Krzysztof Stec et al., (2017).

4.11 TEST RESULTS ON TRIGLYCERIDES

The bio-chemical variable namely triglycerides was measured through lab test. The results on the efficacy of isolated asana, pranayama and suryanamaskar training and control groups are presented in table -XXIX.

TABLE XXIX

COMPUTATION OF ANALYSIS OF COVARIANCE ON TRIGLYCERIDES

(In mg / dl)

Test	Means				Source of Variance	Sum of Square	Degree of Freedom	Mean Square	Obtained 'F' Ratio	'p' value
	AT Group	PT Group	ST Group	Control Group						
Pre Test	100.55	100.10	98.20	103.75	B	318.50	3	106.17	1.69	0.18
					W	4765.70	76	62.71		
Post Test	98.95	95.85	94.40	103.20	B	909.70	3	303.23	5.04*	0.01
					W	4575.50	76	60.20		
Adjusted Post Test	99.04	96.35	96.64	100.40	B	214.09	3	71.36	8.94*	0.01
					W	599.00	75	7.99		
Mean Gain	1.6	4.25	3.8	0.55						

*Significant at 0.05 level of confidence.

The table -XXIX shows that pre test mean scores of tri glycerides of asana training group (ATG) was 100.55, pranayama training group (PTG) was 100.10, suryanamaskar training group (STG) was 98.20 and control group (CG) was 103.75.

The obtained ‘p’ value on pre test scores 0.18 was greater than the 0.05 to be significant at 0.05 level. This proved that there were no significant differences among the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects into groups.

The post test scores analysis proved that there was a significant difference among the groups, as the obtained ‘p’ value 0.01 was lesser than the 0.05. This proved that there were significant differences among the post test means of all the groups.

Taking into consideration of pre and post tests scores among the groups, the adjusted post test were calculated and subjected to statistical treatment. The obtained ‘p’ value of 0.01 was lesser than the 0.05. This proved that there were significant differences among the adjusted post test means of experimental groups due to the respective experimental trainings on triglycerides.

Since the significant differences were recorded, the results were subjected to pair wise comparison among the groups. The results are presented in table -XXX.

TABLE XXX

PAIRED MEAN SIGNIFICANT DIFFERENCE ON TRIGLYCERIDES (In mg / dl)

Adjusted Post Test Means				Mean Difference	'p' Value
AT Group	PT Group	ST Group	Control Group		
-	-	96.64	100.4	3.73*	0.01
-	96.35	-	100.4	4.02*	0.01
-	96.35	96.64	-	0.29	0.75
99.04	-	-	100.4	1.33	0.15
99.04	-	96.64	-	2.4*	0.01
99.04	96.35	-	-	2.69*	0.01

*Significant difference at 0.05 level of confidence.

The table -XXX clearly indicates that the paired mean significant difference on the level of triglycerides of college men among the experimental and control groups. And the variation in triglycerides for college men among the experimental and control groups were found to be significant difference between the paired means of asana training group and pranayama training group, asana training group and suryanamaskar training group, pranayama training group and control group, and suryanamaskar training group and control group on triglycerides.

However, there were no significant between the paired means of asana training group and control group and pranayama training group and suryanamaskar training group on triglycerides.

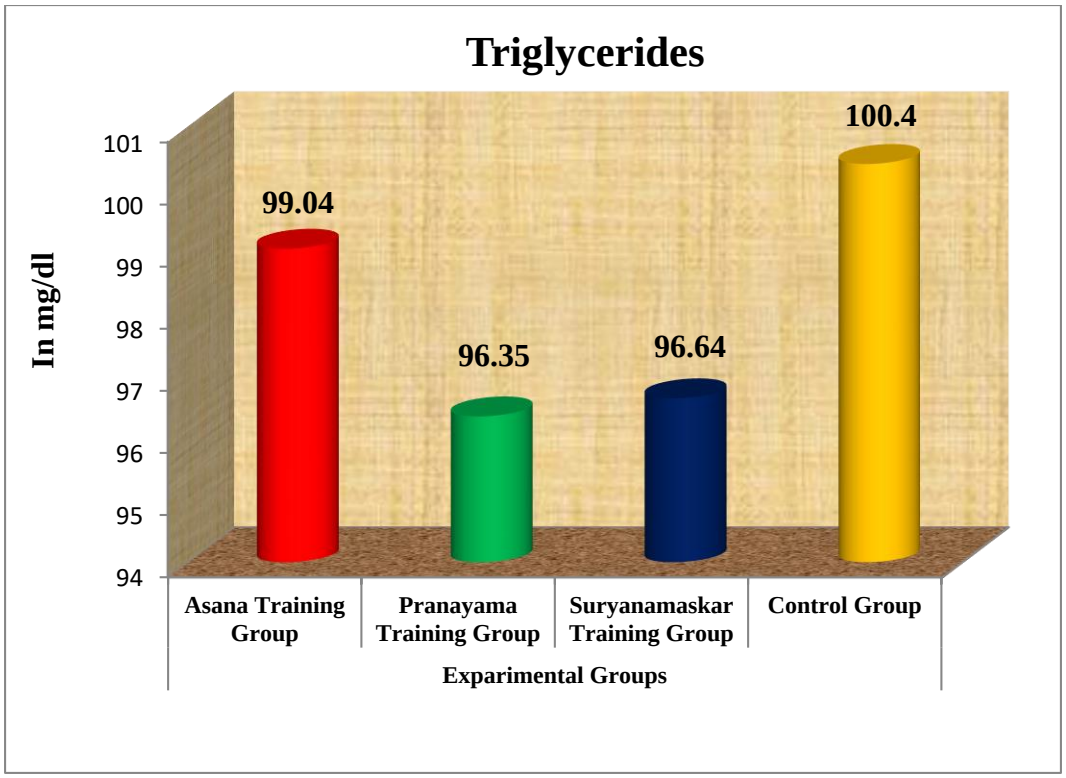


FIGURE 19

FIGURE SHOWING THE ADJUSTED POST TEST MEANS ON TRIGLYCERIDES OF EXPARIMENTAL AND CONTROL GROUPS

4.11.1 Discussion on Findings of Triglycerides

The results presented in the table -XXX showed that the obtained adjusted post test means on triglycerides of asana training group (ATG) was 99.04, pranayama training group (PTG) was 96.35, suryanamaskar training group (STG) was 96.64 and control group (CG) was 100.4. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated by using ANCOVA and 'p' values obtained were 0.75, 0.15, and 0.01 respectively. It was found that the obtained 'p' values on post test scores and adjusted post test mean scores were significantly differ as the obtained 'p' values were lesser than the 'p' value of 0.05.

Probably asana training group (ATG = 1.59%), pranayama training group (PTG = 4.25%) and suryanamaskar training group (STG = 3.87%) would be more effective in causing significant reduction among experimental groups on triglycerides. And also when comparing the adjusted post test mean value of triglycerides the pranayama training group (PTG) had showed better reduction than the other groups.

While testing the effect of asana (ATG), pranayama (PTG) and suryanamaskar (STG) each one had significantly decreased the triglycerides of college men. Whereas the control group was concerned the observed mean difference from base line to post test was not differ significantly. Hence it is understood that the selected training means of the respective experimental group had influenced significantly to decrease the triglycerides.

The result of the study is in consonance with the research done by Acharya, et al., (2010) and Krzysztof Stec et al., (2017).

4.12 RESULTS ON HAND EYE COORDINATION

The psychomotor ability variables namely hand eye coordination was measured through drawing trace board test. The results on the efficacy of isolated asana pranayama and suryanamaskar training and control groups are presented in table -XXXI.

TABLE XXXI

COMPUTATION OF ANALYSIS OF COVARIANCE ON HAND EYE COORDINATION (In Number)

Test	Means				Source of Variance	Sum of Square	Degree of Freedom	Mean Square	Obtained 'F' Ratio	'p' value
	AT Group	PT Group	ST Group	Control Group						
Pre Test	23.65	21.25	23.40	24.05	**B**	94.34	3	31.45	2.10	0.11
					W	1136.05	76	14.95		
Post Test	25.90	25.50	24.60	24.00	**B**	44.40	3	14.80	1.15	0.33
					W	977.60	76	12.86		
Adjusted Post Test	25.41	27.10	24.33	23.16	**B**	158.09	3	52.70	34.41*	0.01
					W	114.87	75	1.53		
Mean Gain	2.25	4.25	1.2	0.05						

*Significant at 0.05 level of confidence.

The table -XXXI shows that pre test mean scores of hand and eye coordination of asana training group (ATG) was 23.65, pranayama training group (PTG) was 21.25, suryanamaskar training group (STG) was 23.40 and control group (CG) was 24.05.

The obtained ‘p’ value on pre test scores 0.11 was greater than the 0.05 to be significant at 0.05 level. This proved that there were no significant differences among the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects into groups.

The post test scores analysis proved that there were no significant difference among the groups, as the obtained ‘p’ value 0.33 was greater than the 0.05. This proved that there were no significant differences among the post test means of all the groups.

Taking into consideration of pre and post tests scores among the groups, the adjusted post test were calculated and subjected to statistical treatment. The obtained ‘p’ value of 0.01 was lesser than the 0.05. This proved that there were significant difference among the adjusted post test means of experimental groups due to the respective experimental trainings on hand and eye coordination.

Since the significant differences were recorded, the results were subjected to pair wise comparison among the groups. The results are presented in table -XXXII.

TABLE XXXII

PAIRED MEAN SIGNIFICANT DIFFERENCE ON HAND EYE COORDINATION (In Number)

Adjusted Post Test Means				Mean Difference	'p' Value
AT Group	PT Group	ST Group	Control Group		
-	-	24.33	23.16	1.17*	0.01
-	27.10	-	23.16	3.94*	0.01
-	27.10	24.33	-	2.77*	0.01
25.41	-	-	23.16	2.25*	0.01
25.41	-	24.33	-	1.08*	0.01
25.41	27.10	-	-	1.69*	0.01

*Significant difference at 0.05 level of confidence.

The table -XXXII clearly indicates that the paired mean significant difference on the level of hand eye coordination of college men among the experimental and control groups. And the variation in hand eye coordination for college men among the experimental and control groups were found to be significant difference between the paired means of asana training group and pranayama training group, asana training group and suryanamaskar training group, asana training group and control group, pranayama training group and suryanamaskar training group, pranayama training group and control group and suryanamaskar training group and control group on hand eye coordination.

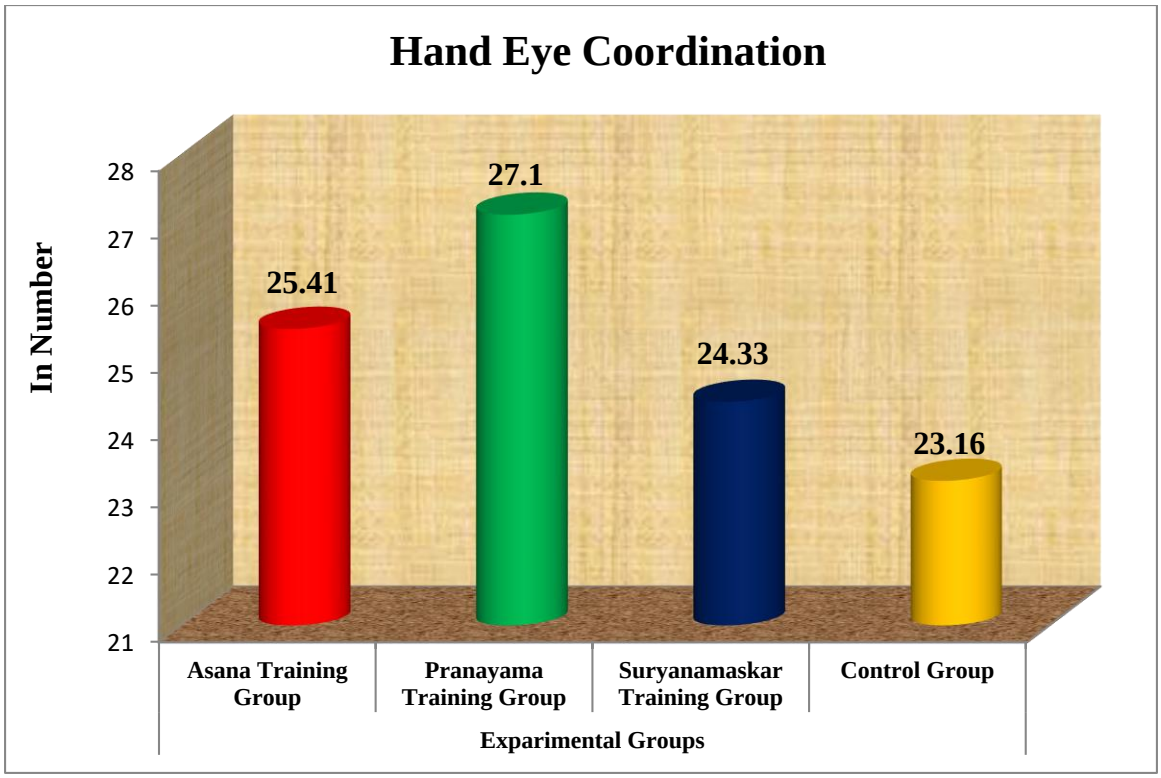


FIGURE 20

FIGURE SHOWING THE ADJUSTED POST TEST MEANS ON HAND EYE COORDINATION OF EXPERIMENTAL AND CONTROL GROUPS

4.12.1 Discussion on Findings of Hand Eye Coordination

The results presented in the table -XXXII showed that the obtained adjusted post test means on hand eye coordination of asana training group (ATG) was 25.41, pranayama training group (PTG) was 27.1, suryanamaskar training group (STG) was 24.33and control group (CG) was 23.16. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated by using ANCOVA and ‘p’ values obtained were 0.11, 0.33 and 0.01 respectively. It was found that the obtained ‘p’ values on post test scores and adjusted post test mean scores were significantly differ as the obtained ‘p’ values were lesser than the ‘p’ value of 0.05.

Probably asana training group (ATG = 9.51%), pranayama training group (PTG = 20%) and suryanamaskar training group (STG = 5.13%) would be more effective in causing significant improvement among experimental groups on hand eye coordination. And also when comparing the adjusted post test mean values of hand and eye coordination the suryanamaskar training group (STG) had better improvement than the other groups.

While testing the effect of asana (ATG), pranayama (PTG) and suryanamaskar (STG) each one had significantly increased the hand eye coordination of college men. Whereas the control group was concerned the observed mean difference from base line to post test was not differ significantly. Hence it is understood that the selected training means of the respective experimental group had influenced significantly to improve the hand eye coordination

The result of the study is in consonance with the research done by Sovan Maiti et al., (2016).

4.13 TEST RESULTS ON LEG EYE COORDINATION

The psychomotor ability variables namely leg eye coordination was measured through drawing trace board test. The results on the efficacy of isolated asana, pranayama and suryanamaskar training and control groups are presented in table -XXXIII.

TABLE XXXIII

COMPUTATION OF ANALYSIS OF COVARIANCE ON LEG EYE COORDINATION (In Number)

Test	Means				Source of Variance	Sum of Square	Degree of Freedom	Mean Square	Obtained 'F' Ratio	'p' value
	AT Group	PT Group	ST Group	Control Group						
Pre Test	42.95	42.85	43.45	40.95	**B**	72.40	3	24.13	1.92	0.13
					W	957.40	76	12.60		
Post Test	44.50	45.05	48.40	41.25	**B**	514.30	3	171.43	13.85*	0.01
					W	940.50	76	12.37		
Adjusted Post Test	44.13	44.77	47.57	42.73	**B**	235.43	3	78.48	50.60*	0.01
					W	116.31	75	1.55		
Mean Gain	1.55	2.2	4.95	0.3						

*Significant at 0.05 level of confidence.

The table -XXXIII shows that pre test mean scores of leg eye coordination of asana training group (ATG) was 42.95, pranayama training group (PTG) was 42.85, suryanamaskar training group (STG) was 43.45 and control group (CG) was 40.95.

The obtained ‘p’ value on pre test scores 0.13 was greater than the 0.05 to be significant at 0.05 level. This proved that there were no significant differences among the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects into groups.

The post test scores analysis proved that there were significant difference among the groups, as the obtained ‘p’ value 0.01 was lesser than the 0.05. This proved that there were significant differences among the post test means of all the groups.

Taking into consideration of pre and post tests scores among the groups, the adjusted post test were calculated and subjected to statistical treatment. The obtained ‘p’ value of 0.01 was lesser than the 0.05. This proved that there was significant difference among the adjusted post test means of experimental groups due to the respective experimental trainings on leg eye coordination.

Since the significant differences were recorded, the results were subjected to pair wise comparison among the groups. The results were presented in table-XXXIV.

TABLE XXXIV

PAIRED MEAN SIGNIFICANT DIFFERENCE ON LEG EYE COORDINATION

(In Number)

Adjusted Post Test Means				Mean Difference	'p' Value
AT Group	PT Group	ST Group	Control Group		
-	-	47.57	42.73	4.84*	0.01
-	44.77	-	42.73	2.04*	0.01
-	44.77	47.57	-	2.79*	0.01
44.13	-	-	42.73	1.39*	0.01
44.13	-	47.57	-	3.43*	0.01
44.13	44.77	-	-	0.64	0.10

*Significant difference at 0.05 level of confidence.

The table -XXXIV clearly indicates that the paired mean significant difference on the level of leg eye coordination of college men among the experimental and control groups. And the variation in hand eye coordination for college men among the experimental and control groups were found to be significant difference between the paired means of asana training group and Suryanamaskar training group, asana training group and control group, pranayama training group and Suryanamaskar training group, pranayama training group and control group and Suryanamaskar training group and control group on leg eye coordination.

However there was no significant between the paired means of asana training group and pranayama training group on leg eye coordination.

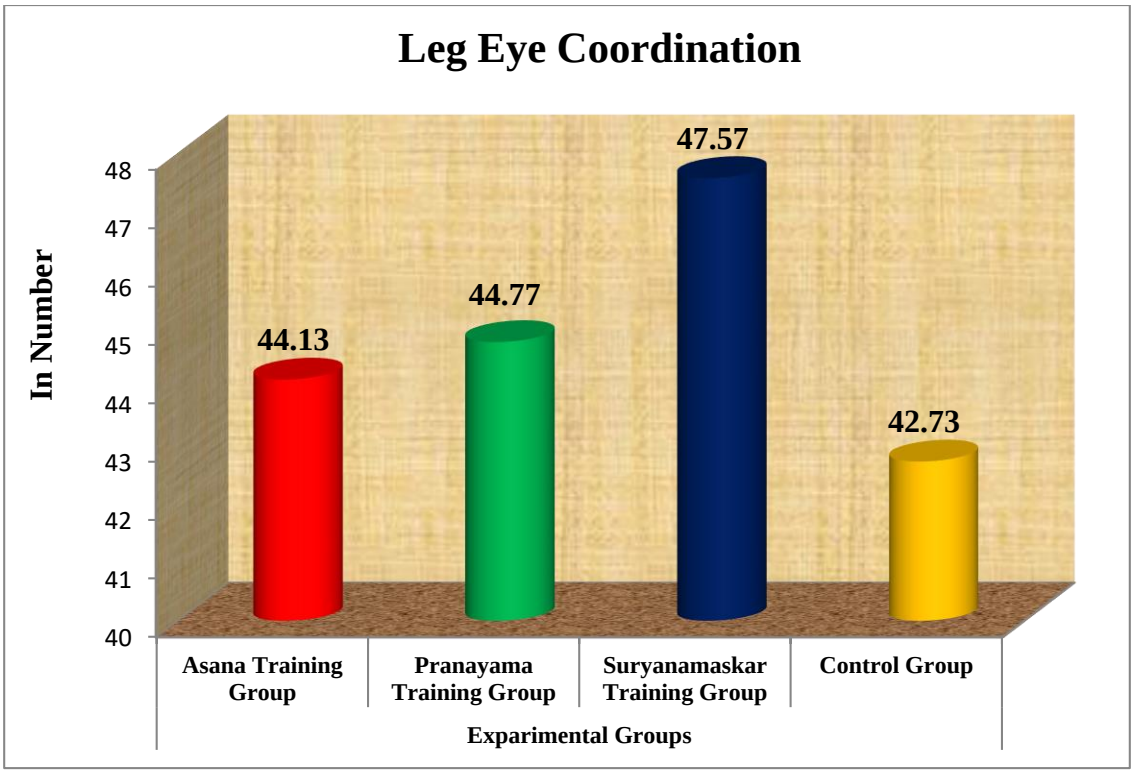


FIGURE 21

FIGURE SHOWING THE ADJUSTED POST TEST MEANS ON LEG EYE COORDINATION OF EXPERIMENTAL AND CONTROL GROUPS

4.13.1 Discussion on Findings of Leg Eye Coordination

The results presented in the table -XXXIV showed that the obtained adjusted post test means on leg eye coordination of asana training group (ATG) was 44.13, pranayama training group (PTG) was 44.77, suryanamaskar training group (STG) was 47.57 and control group (CG) was 42.73.

The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated by using ANCOVA and ‘p’ values obtained were 0.13, 0.01 and 0.01 respectively. It was found that the obtained ‘p’ values on post test

scores and adjusted post test mean scores were significantly differ as the obtained ‘p’ values were lesser than the ‘p’ value of 0.05.

Probably asana training group (ATG = 3.61%), pranayama training group (PTG = 5.13%) and suryanamaskar training group (STG = 11.39%) would be more effective in causing significant improvement among experimental groups on leg eye coordination. And also when comparing the adjusted post test mean values of leg eye coordination the suryanamaskar training group (STG) had better improvement than the other groups.

While testing the effect of asana (ATG), pranayama (PTG) and suryanamaskar (STG) each one had significantly increased the leg eye coordination of college men. Whereas the control group was concerned the observed mean difference from base line to post test was not differ significantly. Hence it is understood that the selected training means of the respective experimental group had influenced significantly to improve the leg eye coordination.

The result of the study is in consonance with the research done by Sovan Maiti et al., (2016).

4.14 RESULTS ON REACTION TIME

The psychomotor ability variables namely reaction time was measured through drawing trace board test. The results on the efficacy of isolated asana, pranayama and suryanamaskar training and control groups are presented in table -XXXV.

TABLE XXXV

COMPUTATION OF ANALYSIS OF COVARIANCE ON REACTION TIME

(In Seconds)

Test	Means				Source of Variance	Sum of Square	Degree of Freedom	Mean Square	Obtained 'F' Ratio	'p' value
	AT Group	PT Group	ST Group	Control Group						
Pre Test	2.22	2.34	2.38	2.39	**B**	0.40	3	0.13	1.11	0.35
					W	9.12	76	0.12		
Post Test	1.57	1.71	2.03	2.41	**B**	8.26	3	2.75	19.03*	0.01
					W	10.99	76	0.15		
Adjusted Post Test	1.64	1.70	2.01	2.38	**B**	6.68	3	2.23	19.40*	0.01
					W	8.61	75	0.12		
Mean Gain	0.65	0.63	0.35	0.02						

*Significant at 0.05 level of confidence.

The table -XXXV shows that pre test mean scores of reaction time of asana training group (ATG) was 2.22, pranayama training group (PTG) was 2.34, suryanamaskar training group (STG) was 2.38 and control group (CG) was 2.39.

The obtained ‘p’ value on pre test scores 0.35 was greater than the 0.05 to be significant at 0.05 level. This proved that there were no significant differences among the experimental and control groups indicating that the process of randomization of the groups was perfect while assigning the subjects into groups.

The post test scores analysis proved that there were significant difference among the groups, as the obtained ‘p’ value 0.01 was lesser than the 0.05. This proved that there were significant difference among the post test means of all the groups.

Taking into consideration of pre and post tests scores among the groups, the adjusted post test were calculated and subjected to statistical treatment. The obtained ‘p’ value of 0.01 was lesser than the 0.05. This proved that there were significant differences among the adjusted post test means of experimental groups due to the respective experimental trainings on reaction time.

Since the significant differences were recorded, the results were subjected to pair wise comparison among the groups. The results are presented in table -XXXVI.

TABLE XXXVI

PAIRED MEAN SIGNIFICANT DIFFERENCE ON REACTION TIME (In Seconds)

Adjusted Post Test Means				Mean Difference	'P' Value
AT Group	PT Group	ST Group	Control Group		
-	-	2.01	2.38	0.37*	0.01
-	1.70	-	2.38	0.67*	0.01
-	1.70	2.01	-	0.30*	0.01
1.64	-	-	2.38	0.74*	0.01
1.64	-	2.01	-	0.37*	0.01
1.64	1.70	-	-	0.07	0.52

*Significant difference at 0.05 level of confidence.

The table -XXXVI clearly indicates that the paired mean significant difference on the level of reaction time of college men among the experimental and control groups. And the variation in reaction time for college men among the experimental and control groups were found to be significant difference between the paired means of asana training group and suryanamaskar training group, asana training group and control group, pranayama training group and suryanamaskar training group, pranayama training group and control group, suryanamaskar training group and control group on reaction time.

However, there was no significant between the paired means asana training group and pranayama training group on reaction time.

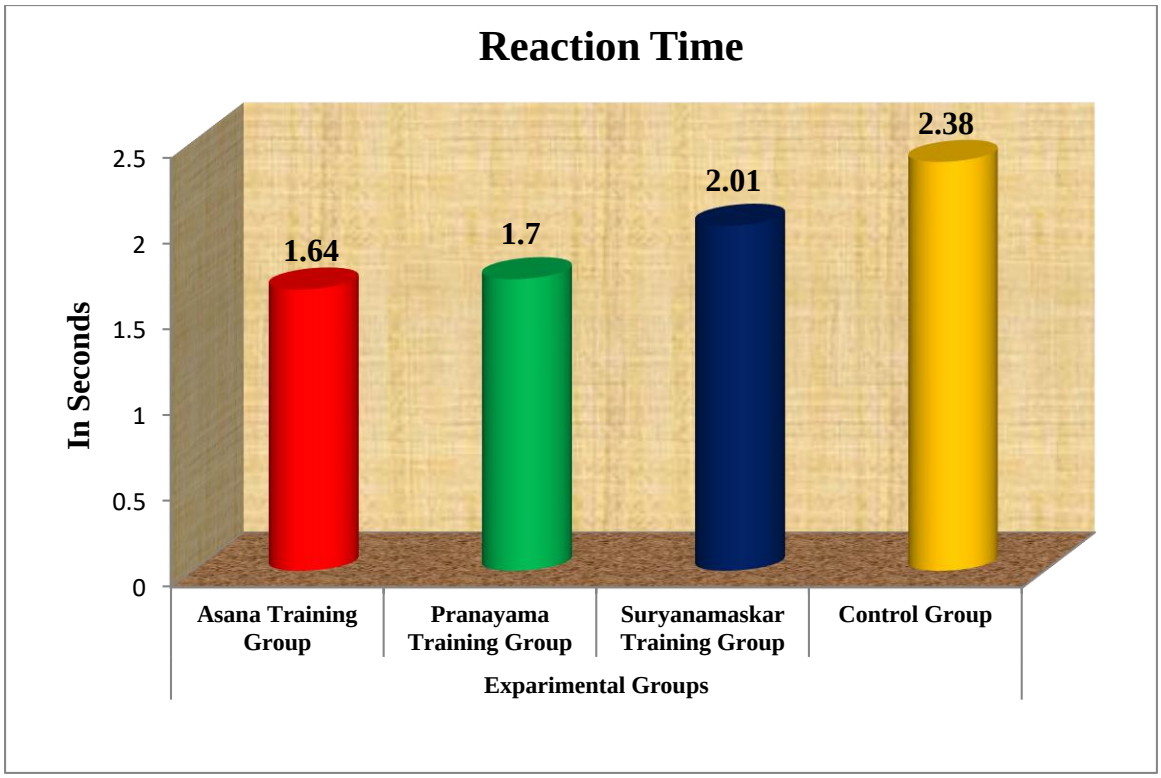


FIGURE 22

FIGURE SHOWING THE ADJUSTED POST TEST MEANS ON REACTION TIME OF EXPERIMENTAL AND CONTROL GROUPS

4.14.1 Discussion on Findings of Reaction Time

The results presented in the table -XXXVI showed that the obtained adjusted post test means on reaction time of asana training group (ATG) was 1.64, pranayama training group (PTG) was 1.70, suryanamaskar training group (STG) was 2.01 and control group (CG) was 2.38. The differences among pre test scores, post test scores and adjusted mean scores of the subjects were statistically treated by using ANCOVA and 'p' values obtained were 0.35, 0.01 and 0.01 respectively. It was found that the obtained 'p' values on post test scores and adjusted post test mean scores were significantly differ as the obtained 'p' values were lesser than the 'p' value of 0.05.

Probably asana training group (ATG = 28.83%), pranayama training group (PTG = 27.35%) and suryanamaskar training group (STG = 14.71%) would be more effective in causing significant reduction among experimental groups on reaction time. And also when comparing the adjusted post test mean values of reaction time the asana training (ATG) had showed better reduction than the other groups.

While testing the effect of asana (ATG), pranayama (PTG) and suryanamaskar (STG) each one had significantly decreased the reaction time of college men. Whereas the control group was concerned the observed mean difference from base line to post test was not differ significantly. Hence it is understood that the selected training means of the respective experimental group had influenced significantly to decrease the reaction time.

The result of the study is in consonance with the research done by Tejaswini, Sonwane, et al., (2016) and Bhavanani et al., (2013).

4.15 DISCUSSIONS ON HYPOTHESES

The first hypothesis stated that there may be significant improvement from base line to post treatment on the selected physiological, bio chemical and psycho motor ability variables due to the efficacy of asana training.

From the statistical finding it was found that there was a significant improvement in the selected physiological, bio chemical and psycho motor ability variables due to asana training, when comparing pre and post-tests values of asana training group. The physiological variables namely cardio respiratory endurance, vital capacity and VO_2 max., bio chemical variables namely high density lipoprotein, and psycho motor ability variables namely hand eye coordination and leg eye coordination had significantly

improved through asana training. And also the bio chemical variables namely serum cholesterol, low density lipoprotein, very low density lipoprotein and triglycerides and psycho motor ability variable namely reaction time had significantly reduced through asana training. Since the control group showed no significant improvement, the improvements of the experimental group was due to the impact of asana training alone. Hence the formulated first hypothesis was accepted.

The second hypothesis stated that there may be significant improvement from base line to post treatment on the selected physiological, bio chemical and psychomotor ability variables due to the efficacy of pranayama training.

From the statistical finding it was found that there was a significant improvement in the selected physiological, bio chemical and psycho motor ability variables due to pranayama training, when comparing pre and post-tests values of pranayama training group. The physiological variables namely cardio respiratory endurance, vital capacity and VO_2 max. bio chemical variables namely high density lipoprotein, and psycho motor ability variables namely hand eye coordination and leg eye coordination had significantly improved through pranayama training. And also the bio chemical variables namely serum cholesterol, low density lipoprotein, very low density lipoprotein and triglycerides and psycho motor ability variable namely reaction time had significantly reduced through pranayama training. Since the control group showed no significant improvement, the improvements of the experimental group was due to the impact of pranayama training alone. Hence the formulated second hypothesis was accepted.

The third hypothesis stated that there may be significant changes from base line to post treatment on the selected physiological, bio chemical and psycho motor variables due to the efficacy of suryanamaskar training.

From the statistical finding it was found that there was a significant improvement in the selected physiological, bio chemical and psycho motor ability variables due to suryanamaskar training, when comparing pre and post-tests values of suryanamaskar training group. The physiological variables namely cardio respiratory endurance, vital capacity and VO_2 max. bio chemical variables namely high density lipoprotein, and psycho motor ability variables namely hand eye coordination and leg eye coordination had significantly improved through suryanamaskar training. And also the bio chemical variables namely serum cholesterol, low density lipoprotein, very low density lipoprotein and triglycerides and psycho motor ability variable namely reaction time had significantly reduced through suryanamaskar training. Since the control group showed no significant improvement, the improvements of the experimental group was due to the impact of suryanamaskar training alone. Hence the formulated third hypothesis was accepted.

The fourth hypothesis stated that there may be significant difference among experimental and control groups on the selected physiological, bio chemical and psycho motor ability variables due to the respective experimental training.

From the statistical findings it was found that there were significant differences among experimental and control groups on the selected physiological, bio chemical and psycho motor variables due to the respective experimental training. Hence the formulated fourth hypothesis was accepted.

Chapter V

Summary Conclusions and Recommendations

CHAPTER V

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY

Yoga was developed thousands of years ago in India. This joining is achieved through the practice and mastering of specific physical postures is called asana, breathing exercises called pranayama. Yoga is the way of life. There are modern schools, each having its own distinct emphasis regarding the relative content of physical postures, breathing techniques, deep relaxation practices that are known as hatha yoga.

Yogic exercises recharge the body with cosmic energy. This facilitates attains perfect equilibrium and harmony, promotes self- healing, removes negative blocks from the mind and toxins from the body, enhances personal power, increases self-awareness, helps in attention focus and concentration, especially important for children and reduces stress and tension in the physical body by activating the parasympathetic nervous system, the aspirant feels rejuvenated and energized. Thus, yoga bestows upon every aspirant powers to control body and mind.

The art of practicing yoga helps in controlling an individual mind, body and soul. It brings together physical and mental disciplines to achieve a peaceful body and mind, it helps to manage stress and anxiety to keeps you in relaxing state. It also helps in increasing flexibility, muscle strength and body tone. It improved respiration, energy and vitality. Practicing yoga might seem like just stretching, but it can do much more for your body from the way you feel, look and move.

To execute the present study the research investigator selected the subjects from, Sri Venkateswara University affiliated colleges, Tirupathi, Chittoor District, Andhra Pradesh, India. In this study, eighty college men the age group of 17 to 21 years were selected as subjects. A pre and post tests were taken for this investigation. The subjects were randomly assigned into four equal groups. Each group consists of twenty subjects. Experimental groups namely asana training group (ATG), pranayama training group (PTG), suryanamaskar training group (STG) and control group (CG). In these all the three experimental groups had undergone 12 weeks of asana, pranayama and suryanamaskar practices respectively and the control group was not exposed to any specific training but they were participating in their regular activity. All the 80 subjects were tested on the selected physiological variables namely cardio respiratory endurance (CRE), vital capacity (VC) and VO_2 Max. bio-chemical variables namely serum cholesterol(SC), high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL) and triglycerides (TG) and psychomotor ability variables, namely hand eye coordination (HEC) and leg eye coordination (LEC) and reaction time (RT). The pre-test were taken before the respective training period and post-tests were taken after the training period. The pre test and post test scores were subjected to statistical analysis by using paired ‘t’ test to find out the significant improvement between pre and post tests and analysis of covariance (ANCOVA) to find out the significant mean differences among the experimental and control groups and whenever the ‘F’ ratio for adjusted post test was found to be significant, paired mean comparison were seen in order to find out which paired mean had got significant difference. In all cases 0.05 level of significance was fixed to test hypotheses.

5.2 CONCLUSIONS

Based on the findings and within the limitations imposed by the experimental conditions the following conclusions were drawn.

The asana training influenced significantly to improve the selected physiological variables namely, cardio respiratory endurance, vital capacity and maximum oxygen consumption (VO_2 Max.), bio-chemical variable namely High Density Lipoprotein and psychomotor ability variables namely hand eye coordination and leg eye coordination and to reduce the selected bio-chemical variables namely Low Density Lipoprotein, Very Low Density Lipoprotein and triglycerides and psychomotor ability variable namely reaction time.

The pranayama training influenced significantly to improve the selected physiological variables namely, cardio respiratory endurance, vital capacity and maximum oxygen consumption (VO_2 Max.), bio-chemical variable namely High Density Lipoprotein and psychomotor ability variables namely hand eye coordination and leg eye coordination and to reduce the selected bio-chemical variables namely Low Density Lipoprotein, Very Low Density Lipoprotein and triglycerides and psychomotor ability variable namely reaction time.

The suryanamaskar training influenced significantly to improve the selected physiological variables namely, cardio respiratory endurance, vital capacity and maximum oxygen consumption (VO_2 Max.), bio-chemical variable namely High Density Lipoprotein and psychomotor ability variables namely hand eye coordination and leg eye coordination and to reduce the selected bio-chemical variables namely Low Density

Lipoprotein, Very Low Density Lipoprotein and triglycerides and psychomotor ability variable namely reaction time.

There were significant difference among the experimental and control groups on the selected physiological, bio chemical and psychomotor ability variables due to the 12 weeks of asana, pranayama and suryanamaskar trainings.

While comparing the effect of asana training, pranayama training and suryanamaskar training, the asana training had produced better reduction in serum cholesterol and reaction time than the other training. The pranayama training had produced better improvement in vital capacity, VO_2 Max. and High Density Lipoprotein and better reduction in Very Low Density Lipoprotein and triglycerides than the other training. Likewise the suryanamaskar training had produced better improvement in cardio respiratory endurance, hand eye coordination and leg eye coordination and better reduction in Low Density Lipoprotein than the other training.

5.3 RECOMMENDATIONS

Based on the results of the study the following recommendations have been made**.**

1. The results found in this study may be utilized by fitness trainer, director of physical education and coaches, to enhance the health status of youth boys.
2. The asana training, pranayama training and suryanamaskar training may be utilised to improve the level of physiological, bio chemical and psychomotor ability variables for college men students
3. Based on the conclusions of this study it is suggested that asana training, pranayama training and suryanamaskar training may be given to school level boys.

4. Based on the conclusions of this study it is suggested that asana training, pranayama training and suryanamaskar training can be given to sportsmen to improve their level on the selected physiological, bio chemical and psychomotor ability variables for their better performance in sports.
5. It is suggested that any one of the asana training, pranayama training and suryanamaskar training may be given to the other age groups also to maintain their general fitness.

5.4 SUGGESTIONS FOR FUTURE RESEARCH

1. This study may be conducted on physical fitness variables and also with different training programmes.
2. This study with combined training may be conducted with different variables.
3. This study may be conducted with the inclusion of psychological variables**.**
4. This study may be conducted on different age category and female students.
5. This study may be conducted on other physiological, bio chemical and psychomotor ability variables.
6. This study can be conducted on the effect of this training may be used for other set of population by modifying the training load.
7. It is suggested for further studies to explore the effect of asana training, , pranayama training and suryanamaskar training after considering the diet as one of the control variables.

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Appendices

APPENDIX A

RAW SCORE OF ASANAS TRAINING GROUP-I																						
Ex. G.I	**Physiological Variables**						**Bio-Chemical Variables**										**Psychomotor Ability Variables**					
S. No.	**12 Min. Run / Walk Test**		**Vital Capacity**		**VO_2 Max.**		**Serum Cholesterol**		**HDL**		**LDL**		**VLDL**		**Tri Glycerides**		**Hand Eye Co-Ordinartion**		**Leg Eye Co-Ordinartion**		**Reaction Time**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
1	2170	2421.64	3.36	3.88	27.33	28.39	186	178	43	47	102	99	21.6	19.4	108	106	20	23	38	39	2.57	2.01
2	2250	2643.9	3.47	3.87	36.01	39.19	179	175	49	50	102	98	20.4	18.2	102	101	26	28	44	45	1.53	1.22
3	2637.8	2800.2	3.46	3.89	30.69	31.72	165	158	42	46	90	89	19.8	18.9	99	98	25	28	43	44	2.14	1.99
4	2401.8	2502.7	3.69	3.97	34.05	36.12	178	174	39	41	99	96	21.8	19.3	109	108	22	26	44	45	2.21	1.98
5	2050	2213.21	3.85	3.95	30.69	32.11	162	160	46	47	99	97	18.4	18.2	90	89	24	25	48	49	2.09	1.09
6	2430	2521.4	3.65	3.93	25.65	26.61	159	156	43	46	102	99	18.8	18.4	94	93	21	24	46	48	1.56	1.12
7	2235.5	2341.5	3.25	3.89	29.41	30.03	170	159	44	49	94	91	20.4	19.2	102	99	26	27	38	39	2.25	1.99
8	1860	2100.28	3.43	3.82	34.05	35.05	185	182	38	42	102	100	21.6	20.3	108	103	30	32	50	51	1.65	1.11
9	2200	2389.38	3.76	3.97	30.69	31.76	179	175	44	46	90	89	18.6	19.5	103	101	26	28	39	40	2.66	1.99
10	2400	2502.5	3.54	3.95	34.05	35.17	151	149	41	46	104	101	20.2	19.01	116	113	25	27	42	43	1.89	1.07
11	2060.4	2213.21	3.63	3.99	27.33	29.33	174	164	42	44	98	95	19.8	19.4	99	98	26	27	40	43	2.56	1.55
12	2440	2521.4	3.34	3.99	34.65	35.19	169	156	45	47	98	94	18.4	18.2	92	92	28	30	47	50	2.11	1.99
13	2235.5	2341.43	3.42	3.97	27.33	28.56	167	160	48	50	99	97	19.4	19.4	97	96	16	20	45	48	2.58	1.96
14	2170	2321.64	3.64	3.94	37.41	38.67	181	178	47	49	95	90	21.6	20.3	108	107	22	23	46	49	2.45	1.44
15	2165	2167.64	3.52	3.89	25.65	28.64	174	168	48	50	98	95	19.8	18.4	99	97	16	19	47	50	2.68	1.91
16	2560	2643.8	2.85	3.99	32.47	34.37	148	137	43	46	106	104	17.2	16.8	85	84	21	25	38	39	2.36	1.92
17	2637.8	2700.2	3.29	3.87	39.09	39.09	168	154	45	49	102	98	18.2	17.8	90	89	28	29	39	40	2.33	1.01
18	2405	2502	3.47	3.66	27.33	28.41	187	169	39	41	99	97	21.2	19.8	106	104	24	26	46	47	2.57	1.01
19	2230	2441.4	3.39	3.79	30.69	32.78	176	174	48	50	102	99	19.4	18.2	97	96	26	27	38	39	1.54	1.14
20	2102	2321.64	3,83	3.97	30.69	31.78	186	171	49	56	99	95	21.4	20.2	107	105	21	24	41	42	2.62	1.99

APPENDIX B

RAW SCORE OF PRANAYAMAS TRAINING GROUP-II																						
Ex. G.II	**Physiological Variables**						**Bio-Chemical Variables**										**Psychomotor Ability Variables**					
S. No.	**12 Min. Run / Walk Test**		**Vital Capacity**		**VO_2 Max.**		**Serum Cholesterol**		**HDL**		**LDL**		**VLDL**		**Tri Glycerides**		**Hand Eye Co-Ordinartion**		**Leg Eye Co-Ordinartion**		**Reaction Time**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
1	2170	2421.64	3.36	3.91	27.33	28.39	186	178	44	48	101	100	20.8	18.4	105	102	22	26	36	39	2.57	1.54
2	2250	2643.9	3.47	3.97	29.01	31.19	179	170	50	50	103	96	20.9	17.2	102	98	23	28	44	46	1.53	1.51
3	2637.8	2800.2	3.46	3.89	30.69	32.72	165	160	43	47	94	90	19.7	17.8	100	95	21	24	43	45	2.14	2.12
4	2401.8	2602.7	3.79	3.97	34.05	36.12	178	154	40	42	103	98	21.4	18.2	101	105	21	25	42	45	2.21	2.11
5	2070	2213.21	3.85	3.95	29.69	32.11	162	157	46	48	101	94	18.2	17.2	96	88	22	26	47	49	2.09	1.38
6	2530	2621.4	3.65	3.97	26.65	26.61	159	152	44	48	104	95	18.5	16.4	97	90	20	24	44	47	2.56	1.13
7	2235.5	2341.5	3.35	3.91	29.01	32.33	170	164	45	50	98	96	20.6	18.2	103	95	24	26	38	40	2.25	1.21
8	1960	2100.28	3.48	3.85	34.05	35.05	185	178	39	43	102	98	20.8	19.3	109	100	27	30	50	53	1.65	1.24
9	2300	2489.38	3.76	3.97	30.69	31.76	169	159	45	46	100	97	19.6	17.5	104	98	24	28	39	41	2.66	1.69
10	2500	2602.5	3.54	3.95	34.05	35.57	151	150	41	46	103	93	20.5	18.12	114	112	23	26	42	46	2.89	1.38
11	2060.4	2213.21	3.73	3.99	27.33	31.56	174	170	43	45	99	90	18.9	17.4	99	95	21	26	42	45	2.16	2.55
12	2440	2521.4	3.34	3.99	34.05	36.19	159	157	44	47	99	95	18.3	16.2	94	91	23	28	47	48	2.11	1.49
13	2235.5	2361.43	3.52	3.98	26.33	30.56	167	163	49	51	100	90	19.3	17.4	96	92	12	16	45	48	2.58	2.46
14	2276	2321.64	3.64	3.94	36.41	38.67	181	180	46	50	103	94	21.2	19.3	107	102	21	25	49	50	2.45	1.43
15	2165	2297.87	3.52	3.89	25.65	30.64	174	170	49	51	98	90	19.2	18.1	99	92	12	19	48	50	2.68	1.63
16	2660	2643.8	2.85	3.99	32.37	34.37	148	145	44	48	103	100	17	15.8	84	81	21	25	38	39	2.36	1.74
17	2637.8	2700.2	3.29	3.87	39.09	39.88	158	154	46	50	103	95	18.1	16.8	90	85	21	26	39	40	2.33	2.1
18	2405	2602	3.57	3.79	27.33	29.43	186	183	40	44	100	95	20.6	18.8	104	102	25	30	45	47	2.57	2.21
19	2230	2441.4	3.39	3.89	30.69	32.89	174	170	48	50	103	99	19.2	17.2	95	92	21	27	38	39	2.52	1.1
20	2202	2430.64	3,83	3.97	30.69	31.88	187	185	49	51	102	96	20.9	19.2	103	102	21	25	41	44	2.56	2.15

APPENDIX C

RAW SCORE OF SURYANAMASKAR TRAINING GROUP-III																						
Ex. G.III	**Physiological Variables**						**Bio-Chemical Variables**										**Psychomotor Ability Variables**					
S. No.	**12 Min. Run / Walk Test**		**Vital Capacity**		**VO_2 Max.**		**Serum Cholesterol**		**HDL**		**LDL**		**VLDL**		**Tri Glycerides**		**Hand Eye Co-Ordinartion**		**Leg Eye Co-Ordinartion**		**Reaction Time**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
1	2200	2305	3.24	3.51	27.33	27.4	186	184	44	48	103	94	20.8	19.14	114	110	20	21	42	46	2.34	2.04
2	2545	2743.8	3.5	3.77	28.01	31.19	179	177	50	50	103	91	20.1	18.12	99	98	24	25	44	49	2.32	1.1
3	2765	2800.4	3.4	3.81	30.69	31.71	165	161	43	46	105	93	19.2	18.19	94	93	23	25	43	49	2.14	2.1
4	2350	2512.9	2.95	3.53	34.05	35.25	178	175	40	41	99	94	21.3	17.23	96	93	22	25	44	50	2.43	2.1
5	2120	2175	2.84	3.51	30.69	31.69	162	159	47	47	99	93	19.5	17.12	107	88	24	26	48	51	2.54	2
6	2342	2621.5	3.39	3.67	25.65	26.56	149	147	44	46	103	96	19.4	18.4	99	92	22	24	46	50	1.56	1.49
7	2150	2341.2	3.65	3.74	29.01	30.17	160	157	45	49	97	90	20.9	19.21	84	82	26	28	38	46	2.5	2.12
8	2200	2001	3.04	3.59	32.05	36.05	185	181	39	43	101	94	21.5	19.3	90	89	30	31	50	54	2.09	1.49
9	2140	2389.31	3.54	3.67	30.69	31.59	169	167	45	47	91	84	21.4	19.51	104	100	30	32	40	45	2.56	2.51
10	2387	2592.2	3.74	3.87	34.05	35.09	151	148	42	46	104	97	21.3	19.11	95	91	23	22	42	48	2.04	1.68
11	2053.2	2250	3.63	3.89	27.33	28.66	164	161	43	48	98	92	19.8	19.42	103	97	23	25	42	49	3.1	2.42
12	2243	2621.3	3.44	3.97	32.05	34.05	169	167	46	45	98	93	19.7	18.21	92	91	23	25	47	52	2.56	2.01
13	2130	2500	3.42	3.69	27.33	29.78	167	164	47	50	99	93	20.67	18.42	97	95	15	17	45	51	2.34	1.78
14	2231	2421.64	3.77	3.89	35.41	38.41	181	177	48	49	92	84	20.9	19.31	108	105	22	23	49	52	2.54	2.01
15	2610	2521.64	2.92	3.51	27.75	25.65	174	170	46	50	98	96	19.5	18.42	99	97	16	19	48	51	2.67	2.41
16	2333	2800	3.72	3.86	32.07	33.19	148	146	45	46	105	98	17.5	16.81	85	83	21	22	38	44	2.45	2.03
17	2654	2721.22	3.24	3.77	39.09	40.19	168	163	44	49	104	96	18.1	17.18	90	88	26	28	39	44	2.43	2.19
18	2132	2700	3.43	3.86	26.33	28.39	187	181	40	41	99	93	21.2	17.28	106	102	30	31	46	48	2,67	2.16
19	2090	2441.43	3.32	3.89	30.69	32.69	156	154	43	50	102	96	19	17.42	97	92	26	20	38	44	2.43	2.41
20	2290	2321.64	3,67	3.97	29.59	30.69	186	182	49	56	98	93	20.6	19.2	105	102	22	23	40	45	2.65	2.62

APPENDIX D

CONTROL GROUP-IV																						
Ex. G.IV	**Physiological Variables**						**Bio-Chemical Variables**										**Psychomotor Ability Variables**					
S. No.	**12 Min. Run / Walk Test**		**Vital Capacity**		**VO_2 Max.**		**Serum Cholesterol**		**HDL**		**LDL**		**VLDL**		**Tri Glycerides**		**Hand Eye Co-Ordinartion**		**Leg Eye Co-Ordinartion**		**Reaction Time**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
1	2199	2198	3.21	3.24	25.65	27.33	151	160	47	43	95	100	22.3	22.1	115	113	20	21	40	39	2.87	2.78
2	2430	2433	3.4	3.41	32.37	33.05	173	172	43	42	100	96	20.3	20.2	100	103	27	26	41	40	2.45	2.41
3	2080	2081	3.3	3.31	39.09	39.15	168	176	44	45	99	100	19.6	20.3	95	93	26	27	42	44	2.89	2.82
4	2350	2369	2.19	2.21	27.33	27.9	167	159	47	48	96	100	19.9	19.2	99	96	23	22	42	43	2.21	2.19
5	2410	2471	2.1	2.2	30.69	30.72	170	169	46	47	100	98	22.4	20.7	110	110	20	18	39	40	2.15	2.1
6	2670	2598	3.61	3.61	30.69	32.37	172	180	44	43	98	97	20.3	19.3	102	101	21	22	40	38	2.15	2.11
7	2370	2372	3.38	3.41	27.33	29.3	148	145	43	44	98	100	18.2	18.1	89	85	25	25	43	42	2.3	2.2
8	2370	2360	3.56	3.49	29.01	27.33	167	165	46	47	102	99	19.2	19.1	92	100	22	21	40	41	2.63	2.6
9	2170	2169	3.34	3.32	27.33	26.54	186	190	39	40	98	98	23.4	23.1	107	105	29	29	40	43	2.65	2.6
10	2300	2400	3.64	3.65	29.6	28.4	174	173	47	45	99	98	20.3	20.1	99	97	29	28	39	40	1.9	2.34
11	2100	2101	3.73	3.73	28.6	27.33	184	178	48	38	102	101	22.4	23.4	108	103	30	29	45	43	2.67	2.65
12	1900	1901	3.34	3.36	28.23	29.01	183	182	44	45	100	99	21.3	20.1	108	109	25	26	42	39	2.11	2.09
13	2190	2192	3.67	3.65	24.34	23.43	182	187	43	44	103	103	19.2	19.1	99	97	17	18	38	38	2.5	2.4
14	2312	2314	3.63	3.64	30.12	29.14	186	182	47	45	100	99	22.4	21.5	114	113	21	21	42	44	2.4	2.38
15	2090	2080	2.98	2.91	28.34	30.69	187	184	46	47	99	98	23.4	23.12	117	116	16	17	43	44	2.65	2.69
16	2209	2210	3.72	3.65	28.3	29.01	161	159	42	43	100	99	22.5	22.1	118	117	23	24	38	39	2.41	2.4
17	2034	2035	3.64	3.45	31.23	31.45	175	172	35	36	100	101	20.1	19.1	102	104	27	28	38	40	2.32	2.3
18	2280	2282	3.52	3.51	29.34	29.56	152	160	38	37	99	100	16.3	17.3	90	89	28	27	43	44	2.51	2.49
19	2180	2181	3.22	2.9	32.43	31.32	173	170	40	41	97	95	16.9	17.45	97	98	29	28	41	42	1.52	2.12
20	2200	2201	3,66	3.69	33.43	32.32	170	173	39	40	98	100	21.6	21.03	114	115	23	23	43	42	2.62	2.45

APPENDIX E - PHOTO GALLARY OF ASANA TRAINING GROUP

Vajrasana

Supta Vajrasana

Pachimotanasana

Bhujanagasana

Sarvangasana

Salabhasana

Dhanurasna

Halasana

Navasana

Padahastasana

Vakrasana

Savasana

APPENDIX F - PHOTO GALLARY OF PRANAYAMA TRAINING GROUP

APPENDIX G - PHOTO GALLARY OF SURYANAMASKAR TRAINING GROUP

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PHYSICAL EDUCATION
UGC Journal No: 63023

EFFECT OF PRANAYAMA TRAINING ON HIGH DENSITY LIPOPROTEIN AND LOW DENSITY LIPOPROTEIN OF COLLEGE MEN

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Abstract

The purpose of this study was to find out the effect of pranayama training on high density lipoprotein and low density lipoprotein of college men. The research scholar selected 40 college men students from Rastriya Sanskrit Vidya Peetha Deemed University College, Tirupathi, Andhara Pradesh. Their ages were ranged from 21 to 25 years. The subjects were divided into two equal groups. Group-I consist 20 subjects called as experimental group and group-II consist of 20 subjects called as control group .The group -I was assigned to pranayama training for a period of 12 weeks. The control group was not undergo in any kind of training. The dependent variables namely high density lipoprotein and low density lipoprotein was selected and measured by lipid profile test (lab test) for this study. The data was analyzed by the use of paired't, test. The obtained 't' ratio was tested for significance at 0.05 level of confidence. The analysis of the data revealed that there was a significant improvement on the selected dependent variables namely high density lipoprotein and low density lipoprotein by the application of pranayama training programme.

Keywords: Pranayama, HDL , LDL.

INTRODUCTION

Yoga provides one of the best means of self improvement and helps to attain one's full potentiality. In the advanced stages of yoga the super conscious states are attained which results feeling of bliss, deep peace and the emergence of psychic powers. It supply of energy and removes any interference to the transmission of energy throughout the body. Pranayama is a sanskrit word, meaning extension of the life force. The word composed of two snaskrit words 'prana' the 'life force' or 'vital energy', particularly 'ayama' means extend or drawn out the breath. The origin of this yogic discipline lies in ancient Hinduism. In Patanhali's astanga yoga the pranayama is the third limb. Which is explaining about control over the breath. The practice of pranayama makes the respiratory system and works up to its optimum, ensuring proper supply of oxygen to the blood and improves circulation throughout the body. Bio-chemical, sometimes called biological chemistry, is the study of chemical processes with and relating to living organisms. By controlling information flow throw bio-chemical signaling and the flow of chemical energy through metabolism, biochemical processes give rise to the complexity of life. Bio- chemical study such things as the structures and properties of biological molecules, proteins, carbohydrates, lipids and nucleic acids. Yogic studies in the field of medicine suggest that yoga provides the optimum balancing of physiological, as well as biochemical wellbeing.

PRANAYAMA

"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.

METHODOLOGY

For the purpose of the study 40 college men students from Rastriya Sanskrit Vidya Peetha Deemed University College, Tirupathi, Andhara Pradesh. Their ages were ranged from 21 to 25 years. The subjects were divided into two equal groups. Group-I consist 20 subjects called as experimental group and group-II consist of 20 subjects called as control group .The group -I was assigned to pranayama training for a period of 12 weeks. The control group was not undergoing any kind of training. The subjects were tested on the selected

dependent variables namely high density lipoprotein and low density lipoprotein was tested with lipid profile test before and after the training period. The collected data was treated by using paired 't'-test. The level of confidence was fixed at 0.05 level.

RESULTS OF THE STUDY

TABLE-I
COMPUTATION OF't' RATIO BETWEEN THE PRE AND POST TESTS ON HDL OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	M	SD	σ DM	DM	t-ratio	'p' value
Experimental	**Pre Test**	44.75	3.22	0.31	3.00	9.75*	0.01
	Post Test	47.75	2.73				
Control	**Pre Test**	43.40	3.60	0.60	0.40	0.67	0.51
	Post Test	43.00	3.43				

* Significance at 0.05 level.

The table I indicates that there was a significant improvement on the high density lipoprotein through the selected pranayama training. It reveals that the obtained t-ratio of HDL 9.75 was significantly improved, because the 'p' value was lesser than the 0.05. So there was a significant improvement on the high density lipoprotein between the pre and post tests of experimental group, where as the control group showed no significant improvement. Hence the results indicated that the significant improvement on the high density lipoprotein was due to the pranayama training alone.

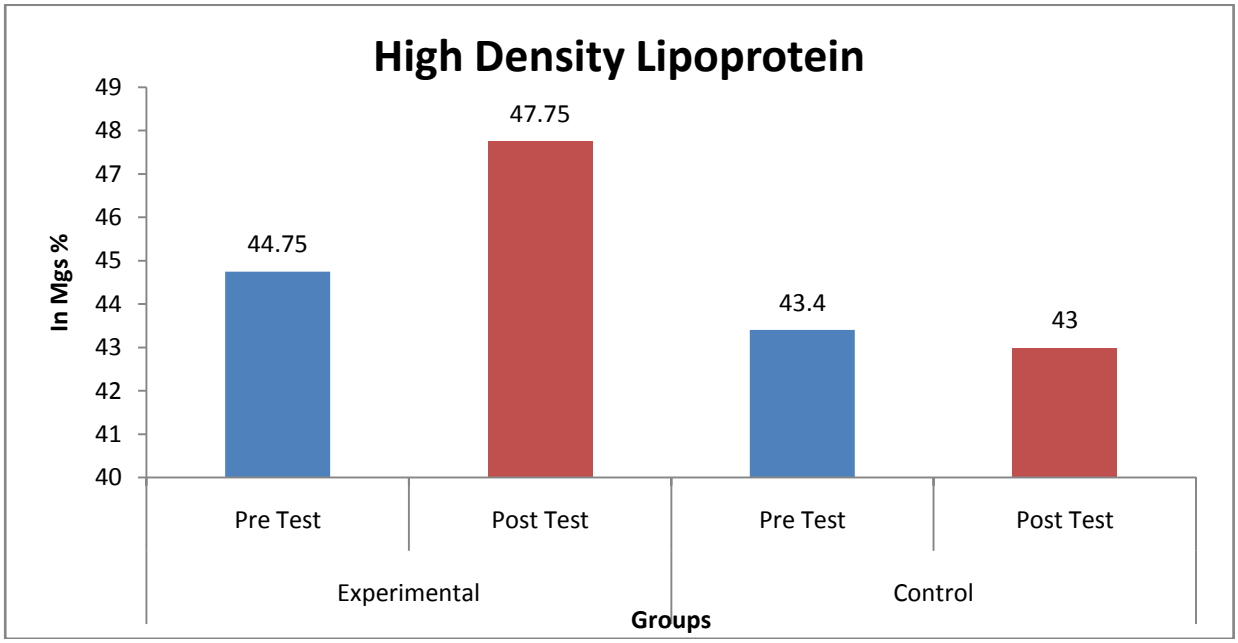

FIGURE I
THE FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST-TESTS SCORES ON HDL OF EXPERIMENTAL AND CONTROL GROUPS

TABLE-II
COMPUTATION OF't' RATIO BETWEEN THE PRE AND POST TESTS ON LDL OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	M	SD	σ DM	DM	't' ratio	'p' value
Experimental	Pre Test	100.95	2.48	0.62	5.90	9.53*	0.01
	Post Test	95.05	3.22				
Control	Pre Test	99.15	1.95	0.49	0.10	0.20	0.84
	Post Test	99.05	1.82				

* Significance at 0.05 level.

The table II indicates that there was a significant reduction on the low density lipoprotein through the pranayama training. It reveals that the obtained 't'ratio 9.53 was significantly differ because the 'p' value was lesser than the 0.05. So there was a significant reduction on the low density lipoprotein between the pre and post tests of experimental group, whereas the control group showed no significant reduction. Hence the result indicated that the significant reduction on the low density lipoprotein was due to the pranayama training alone.

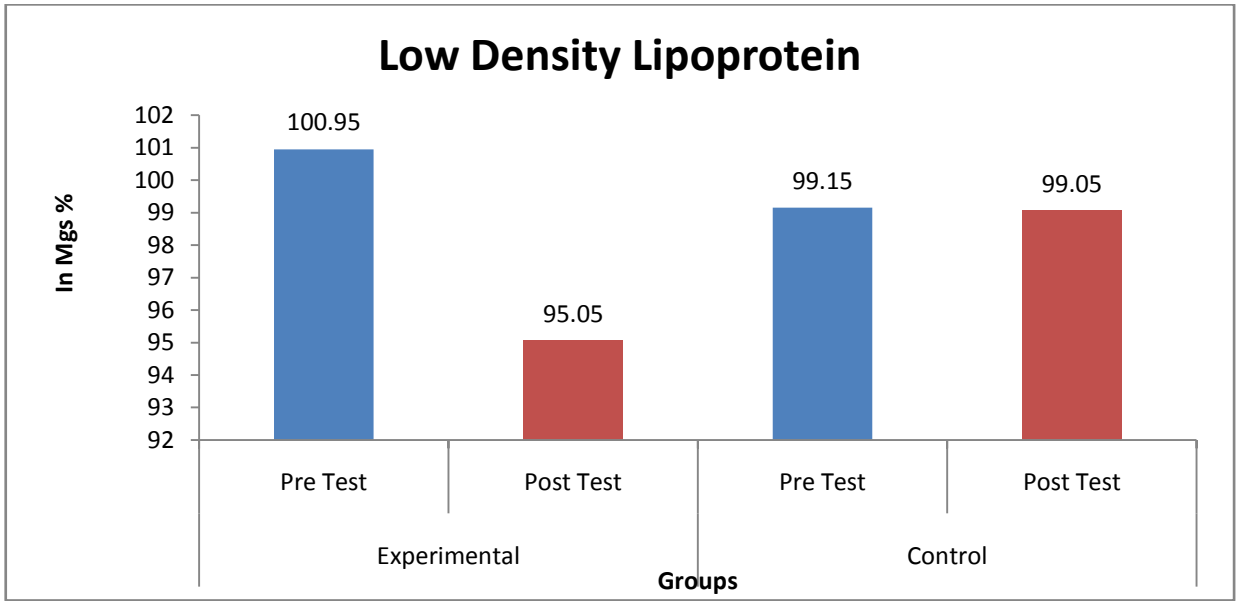

FIGURE II
THE FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST-TESTS SCORES ON LDL OF EXPERIMENTAL AND CONTROL GROUP

DISCUSSION ON FINDINGS

The result of the study reveals that the twelve weeks of pranayama training on the selected dependent variables, there was a significant improvement on the HDL. It reveals that the obtained t-ratio of HDL 9.75 was significantly improved because the 'p' value was lesser than the 0.05. So there was a significant improvement on the HDL between pre and post tests of the experimental group, whereas the control group showed no significant improvement. Hence the result indicates that the significant improvement on the HDL was due to the pranayama training alone. The result of the study is in consonance with the research done by **Deepa S Rathod and Sakpal Hoovanna. (2017).**

The result of the study reveals that the twelve weeks of pranayama training on the selected dependent variable there was a significant reduction on the LDL. It reveals that the obtained t-ratio 9.53 was significant because the 'p' value was lesser than the 0.05, level of confidence. So there was a significant reduction on the

LDL between pre and post tests of the experimental group, whereas the control group showed no significant reduction. Hence the results indicated that the significant reduction on the LDL was due to the pranayama training alone. The result of the study is in consonance with the research done by **Deepa S Rathod and Sakpal Hoovanna. (2017).**

CONCLUSION

It was concluded that there was a significant improvement on the selected dependent variables namely HDL and LDL by the application of pranayama training.

REFERENCE

1. Deepa S Rathod and Sakpal Hoovanna. (2017). effects of yogasanas on physiological and psychological variables of high school girls. *International Journal of Physical Education, Sports and Health*, 4(3), 315-317.

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EFFICACY OF SURYANAMASKAR TRAINING ON SELECTED PSYCHOMOTOR ABILITY VARIABLES OF COLLEGE MEN

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Abstract

The purpose of this study was to find out the efficacy of suryanamaskar training on selected psychomotor variables of college men. The investigator selected 40 college men students from Sri Venkateswara University College of Arts and Science and Sri Govindarajulu College of Arts and Science, Tirupathi, Andhrapradesh. Their ages were ranged from 21 to 25 years. The subjects were divided into two equal groups. Group 1 consist 20 subjects called as experimental group and group 2 consist of 20 subjects called as control group .The group I was assigned to suryanamaskar practice for a period of 12 weeks. The control group was not allowed to participate in any kind of training. The dependent psychomotor ability variables namely leg eye coordination and reaction time was selected and measured by football wall kicking test and chronometer test respectively for this study. The data was analyzed by the use of paired 't' test. The obtained 't' ratio was tested for significance at 0.05 level of confidence. The analysis of the data revealed that there was a significant improvement on the selected dependent variables namely leg eye coordination and reaction time by the application of suryanamaskar training programme.

Keywords: Suryanamaskar, Leg Eye Coordination, Reaction Time.

INTRODUCTION

Yoga is associated with a healthy and lively lifestyle with a balanced approach to life. It is the union between the mind, body and spirit. It involves the practice of physical postures and poses, which is referred to as 'Asana' in Sanskrit. Our modern day lifestyle is too hectic and puts a lot of stress on us which in turn causes a lot of life style problems like obesity, hypertension, high cholesterol, diabetes etc. Yoga is the answer to all these problems. It offers harmless solutions to these problems in the form of relaxation. Studies in the field of medicine suggest that Yoga is the only form of physical activity that provides complete exercise to the body as it incorporates different aspects of science, philosophy and art. It is one of the most effective and integrated systems for gaining control and experiencing supreme joy in life. It helps one achieve optimum physical and psychological health.

SURYANAMASKAR

Sun is the source of all energy. Salutation to the sun or suryanamaskar is thus a prayed to seek the energy or parna from it and vitalize the body, mind and soul. Suryanamaskar has a deep effect in detoxifying the organs through copious oxygenation and has a deeper relaxing effect. It is known as sun salutation. It is having a set of 12 dynamic exercises. It is an age- old yogic practice which contributes to mental, emotional, physical and spiritual well being. The suryanamaskar performed early in the morning, at daybreak, or in the evening, when the sun setting. It is accompanied by a specific breathing pattern and chanting of mantras. The benefits of suryanamaskar include weight loss, regulates and flexibility of muscles, improved concentration, and self-confidence and reduced depression.

METHODOLOGY

For the purpose of the study 40 college men students were selected from Sri Venkateswara University College of Arts and Science and Sri Govindarajulu College of Arts and Science, Tirupathi, Andhra Pradesh and their ages were ranged from 21 to 25 years. The subjects were divided into two equal groups. Group 1 consist 20 subjects called as experimental group and group 2 consist of 20 subjects called as control group .The group I was assigned to suryanamaskar training programme for a period of 12 weeks. The control group was not allowed to participate in any kind of training. The subjects were tested on the selected dependent psychomotor ability variables namely leg eye coordination was tested with football wall kicking test and reaction time was tested by chronometer, before and after the training period. The collected data was treated by using paired t-test. The level of confidence was fixed at 0.05 level.

RESULTS OF THE STUDY

TABLE-I

COMPUTATION OF 'T'-RATIO BETWEEN THE PRE AND POST TESTS ON LEG EYE CO ORDINATION OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	M	SD	σ DM	DM	t-ratio	'p' value
Experimental	**Pre Test**	43.45	3.86	0.34	4.95	14.72*	0.01
	Post Test	48.40	3.05				
Control	**Pre Test**	40.95	1.99	0.36	0.30	0.84	0.41
	Post Test	41.25	2.10				

* significance at 0.05 level.

The table I indicates that there was a significant improvement on the leg eye coordination through the suryanamaskar training. It reveals that the obtained t-ratio 14.72 was differ significantly, because the 'p' value was lesser than the 0.05, level of confidence. So there was a significant improvement on the leg eye coordination between the pre and post tests of experimental group, whereas the control group showed no significant improvement. Hence the results indicated that the significant improvement on the leg eye coordination was due to the suryanamaskar practice alone.

FIGURE I

THE FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST-TESTS SCORES ON LEG EYE COORDINATION OF EXPERIMENTAL AND CONTROL GROUPS

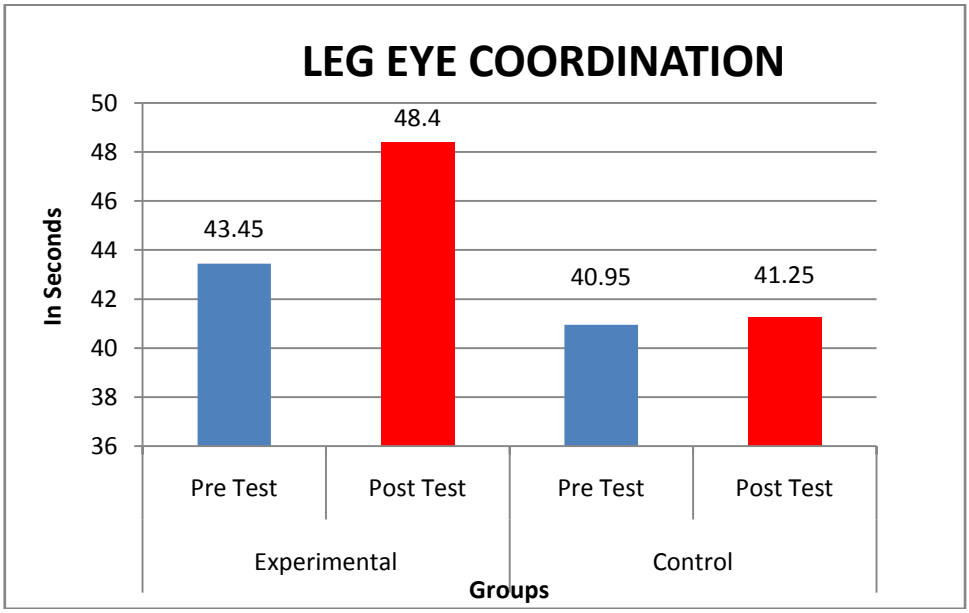


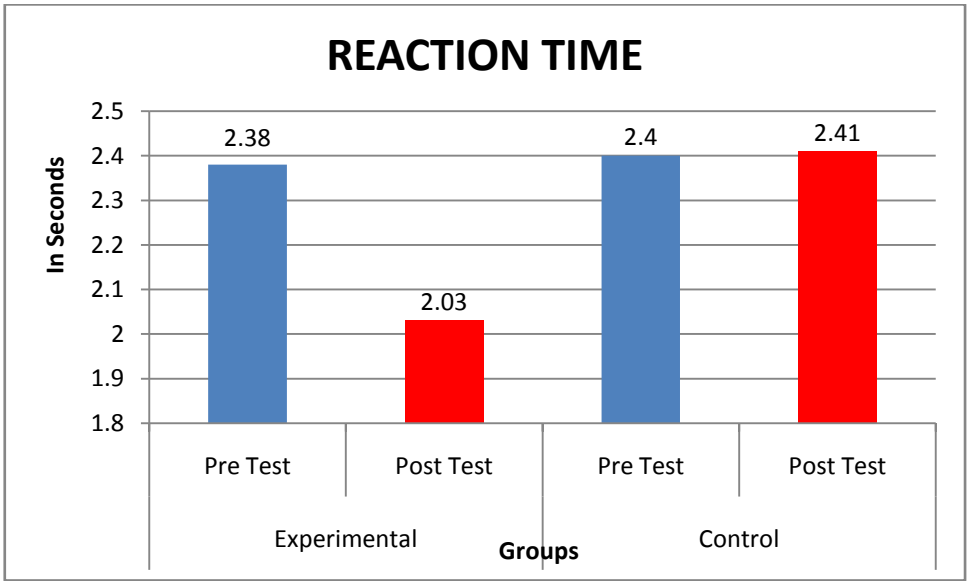
TABLE-II
COMPUTATION OF 'T'-RATIO BETWEEN THE PRE AND POST TESTS ON REACTION TIME OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	M	SD	σ DM	DM	t-ratio	'p' value
Experimental	**Pre Test**	2.38	0.32	0.07	0.35	5.04*	0.01
	Post Test	2.03	0.38				
Control	**Pre Test**	2.40	0.33	0.04	0.01	0.26	0.80
	Post Test	2.41	0.23				

* significance at 0.05 level.

The table II indicates that there was a significant improvement on the reaction time through the suryanamaskar training. It reveals that the obtained t-ratio 5.04 was differ significantly because the 'p' value was lesser than the 0.05 level of confidence. So there was a significant improvement on the reaction time between the pre and post tests of experimental group, whereas the control group showed no significant improvement. Hence the result indicated that the significant improvement on the reaction time was due to the suryanamaskar practice alone.

FIGURE II
THE FIGURE SHOWING THE MEAN DIFFERENCE OF PRE AND POST-TESTS SCORES ON REACTION TIME OF EXPERIMENTAL AND CONTROL GROUP



DISCUSSION ON FINDINGS

The result of the study reveals that the twelve weeks of suryanamaskar training on the selected dependent variables there was a significant improvement on the leg eye coordination. It reveals that the obtained t-ratio 14.72 was significant because the 'p' value was lesser than the 0.05, level of confidence. So there was a significant improvement on the leg eye coordination between pre and post tests of the experimental group, whereas the control group showed no significant improvement. Hence the result indicates that the significant improvement on the leg eye coordination was due to the suryanamaskar training alone. The result of the study is in consonance with the research done by **Deepa S Rathod and Sakpal Hoovanna. (2017).**

The result of the study reveals that the twelve weeks of suryanamaskar training on the selected dependent variable there was a significant improvement on the reaction time. It reveals that the obtained t-ratio 5.04 was significant because the 'p' value was lesser than the 0.05, level of confidence. So there was a significant improvement on the reaction time between pre and post

tests of the experimental group, whereas the control group showed no significant improvement. Hence the results indicated that the significant improvement on the reaction time was due to the suryanamaskar training alone. The result of the study is in consonance with the research done by **Deepa S Rathod and Sakpal Hoovanna. (2017).**

CONCLUSIONS

It was concluded that there was a significant improvement on the selected dependent psychomotor ability variables namely leg eye coordination and reaction time by the application of suryanamaskar training.

REFERENCE

1. Deepa S Rathod and Sakpal Hoovanna. (2017). effects of yogasanas on physiological and psychological variables of high school girls. *International Journal of Physical Education, Sports and Health*, 4(3), 315-317.

CERTIFICATE

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SRKV Post, Coimbatore 641 020

NATIONAL CONFERENCE ON

YOGA FOR WORLD PEACE

Date: 26th & 27th February, 2018

With our congratulations, this is to certify that Dr./Mr./Mrs./Ms P. MADANA KUMAR Ph.d Scholar SRKV - Maruthi College of phy. Edu. Coimbatore presented a paper entitled Impact of Asana Training on Very Low Density Lipoprotein and Triglycerides. in the two day **National Conference on Yoga for World Peace** conducted by Sri Ramakrishna Mission Vidyalaya, Maruthi College of Physical Education.

Dr. E. Amudhan
Organising Secretary

Dr. Ch. V.S.T. Saikumar
Principal

Paper Presented

Arise, Awake, and stop not until the goal is reached.
- Swami Vivekananda

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Celebration of 125th Anniversary of Swami Vivekananda's Historic Speech at the World Parliament of Religions in Chicago

National Seminar on

Role of Yoga for Health and Lifestyle Management

1st & 2nd March 2019

With our congratulations, this is to certify that Dr./Mr./Mrs./Ms P. MADANA KUMAR Ph.D. Scholar SRKV - MCPE COIMBATORE presented a paper entitled EFFICACY OF SURYANAMASKAR TRAINING ON HAND EYE COORDINATION AND CARDIO RESPIRATORY ENDURANCE OF COLLEGE MEN. in the two day **National Seminar on Role of Yoga for Health and Lifestyle Management** conducted by Sri Ramakrishna Mission Vidyalaya, Maruthi College of Physical Education.

Dr. E. Amudhan
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Sri Venkateswara University : Tirupati

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(Dr.T.Surendra Natha Reddy)

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Principal

SEICOM Degree College,Tirupathi