COMPARATIVE EFFECT OF AEROBIC EXERCISES AND SELECTED YOGIC PRACTICES ON THE PSYCHOSOMATIC DISORDERS

ABSTRACT

THESIS

SUBMITTED FOR THE AWARD OF THE DEGREE OF

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IN

PHYSICAL HEALTH AND SPORTS EDUCATION

BY

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Under the Supervision of

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ALIGARH MUSLIM UNIVERSITY
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ABSTRACT

Psychosomatic disease are those diseases which, while they have their origin in the Psyche, are clinically diagnosed through somatic symptoms manifested in the body. They are now also called stress diseases expressed through psychophysiological reactions. In simple words, they are mind to body problems, which have simultaneous interaction and mutual influence. Generally, it is believed that emotional effects, caused by the stress and tension of modern life, which are translated into somatic disorders, such as coronary heart disease, hypertension, diabetes, peptic ulcer, insomnia, disorders of the digestive system, etc. At least 72 percent of diseases in metropolitan cities are psychosomatic disease or stress diseases associated with mental or emotional disturbances.

This study is an attempt to assess the effectiveness of Yoga and Aerobic activity in controlling the psychosomatic disorders.

The psychosomatic disorders undertaken in the study are C.H.D., Hypertension, Diabetes, Peptic ulcer and Insomnia.

For the purpose of this study 60 patients of each psychosomatic disorder were selected and divided into three almost equated
subgroup of 20 each on the basis of pre-experimental measures of the various psychosomatic disorders undertaken in the study.

The three subgroups were subjected to the three experimental programmes of Aerobic exercise, Yoga and Combined Aerobic-Yogic exercise for a period of six months.

Thereafter post-test was conducted of the chosen variables of various psychosomatic disorders and the data was collected in the form of following criterion measures -

**CHD**

- LDL levels in mg %,
- HDL levels in mg %,

**Hypertension**

- Systolic and diastolic blood pressure in mmHg,

**Diabetes**

- Fasting blood glucose levels in mg %,

**Peptic Ulcer**

- Clinical and endoscopic ratings of peptic ulcers
INSOMNIA

- Half-hourly counts of wall clock bell, during sleep from 10 p.m. to 6 a.m.

Paired t-test was used to assess the significance of differences between the pre and post-test means of the chosen measures of various psychosomatic disorders. Further F-test was used to test the significance of differences among the pre and post-test means of three groups, where F-test was significant, LSD test was applied to assess, which of the group means differences were most significant.

Results obtained from the analysis of data shows that in most of the cases, the three experimental programmes are effective in medicating the psychosomatic disorders undertaken in the study. However, only Aerobic programme is unable to create a significant effect on the clinical and endoscopic ratings of peptic ulcer.

F-ratios are also significant among the post and adjusted post-test means of the three experimental groups, for all the chosen measures of psychosomatic disorders undertaken in the study.

Further post hoc analysis of the results shows, that in most of the cases Combined Aerobic-Yogic programme is more effective than individual programmes of the Yoga and Aerobic exercise. Also Yogic
programme in most of the cases is more effective than Aerobic exercise programme in medicating significantly the psychosomatic disorders.

For each of the chosen measures the post hoc analysis goes as–

**CHD**-The pre disposing factors associated with coronary heart disease are serum LDL and HDL levels.

**LDL**-The findings of the study clearly indicated that serum LDL levels are significantly reduced in all the three groups towards normal values of 130 to 170 mg %. However, the decrease is more profound in Combined Aerobic-Yogic groups than other two groups. However the Aerobic and Yogic programmes are almost equal in bringing down LDL levels.

**HDL**: The serum HDL levels are significantly increased in all the three groups, however the increase is more in Combined Aerobic-Yogic programme group than the other two groups. The individual Yogic and Aerobic exercise programmes are almost equal in increasing the serum HDL levels.

**Hypertension**: The three experimental programmes are significantly effective in reducing both systolic as well as diastolic blood pressure levels towards normal values. Combined Aerobic-Yogic
programme is however most effective in bringing down both systolic as well as diastolic blood pressure levels toward normal values of 120-82 mmHg. Also Yogic programme is more effective than Aerobic exercise programme in bringing down both systolic and diastolic blood pressures toward normal values.

Diabetes Mellitus: Results of the study shows that fasting blood glucose is significantly reduced towards normal values of all the three groups after the administration of the three programmes. However, Combined Aerobic-Yogic programme is most effective in bringing bring down blood sugar levels towards normal values than individual programmes of Aerobic exercise and Yoga. Yogic programme is more effective than individual programme of Aerobic exercise in bringing down blood sugar levels towards normal values.

Peptic ulcer: Results obtained from the pre and post analysis of clinical and endoscopic ratings of peptic ulcer clearly shows that Yoga and Combined Aerobic-Yogic programme are almost equally effective in medicating peptic ulcer. However, the mean differences of pre and post peptic ulcers ratings (clinical and endoscopic ratings) for Aerobic groups is not significant, which shows that Aerobic activity is unable to create a significant effect on peptic ulcer.
Insomnia: The findings of our study clearly show that all the three programmes are effective in medicating, insomnia. However Aerobic programme is less effective than Yogic and Combined Aerobic-Yogic programme. Yogic and Combined Aerobic-Yogic programme are almost equally effective in medicating insomnia.

Yoga and exercise are helpful in controlling psychophysiological reactions, which results in a harmonious equilibrium among over all bodily functions. Yogic and Aerobic programme are helpful in removing anxiety and stress from the individuals mind, he becomes calm and peaceful. Exercise helps in improving organic functions, leading to smooth psychophysiological reaction pathways, which results in a harmonious body mind relationship through proper co-ordination, balance and neuromuscular control leading to better psychosomatic state of the individual.
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2002
Dedicated

to

My Brother

Brij Bhushan Singh

and

My Beloved Parents
Acknowledgement

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(Manju Lata)
Certificate

I certify that the material contained in this thesis entitled "Comparative Effect of Aerobic Exercises and Selected Yogic Practices on the Psychosomatic Disorders" submitted by Ms. Manju Lata for the award of the degree of Doctor of Philosophy in Physical Health and Sports Education is original.

The work has been done under my supervision. In my opinion the work contained in this thesis is sufficient for the award of a Ph.D. degree in Physical Health and Sports Education.

(Dr. Rajendra Singh)
Supervisor
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Chapter 1

Introduction
Introduction

The present trend of the thought based on a materialistic philosophy of power, prosperity and pleasure has resulted in a form of sensate culture. Worldly values dominate the modern man who reacts to stimuli and struggles for self-preservation, self-aggrandisement and self-gratification. This ego ridden individual seeks freedom and happiness in his nerve-racking hunt for worldly objects which leads to a life of bondage, misery, worries, insecurity, despair, frustration, disillusionment and doubt. The modern man has sold himself to gain reputation, personal power, more money and other selfish ends; he is caught in never-ending mad rush to meet all kinds of unrestrained needs which wear and tear out, his vital organs much sooner. Due to his abnormal living habits, and a exciting, straining life his emotional balance is disturbed. Emotional disturbances can upset glandular functions, metabolic balance and also cause stomach distress. There is a growing awareness of the importance of emotional factor involved in the activities and efficiency of the cardiovascular system. All these reactions really depend on our personality, temperament, emotional stability and attitude, which ultimately determine our stress threshold.
"Men are not disturbed by things, but by the views they take of them" (Epictetus. A.D.60.)

Clinical psychologist, Elbert Ellis, suggests that some commonly held beliefs are irrational and self-defeating because they lead to unnecessary emotional distress (Ellis & Grieger, 1977). The most basic belief among them is perhaps that it is terrible and catastrophic when things and people (including ourselves) are not the way we expect them to be. Irrationality of this idea is seen by Ellis in two ways. One, things are seldom awful or catastrophic (They are merely annoying and frustrating) two, it is self-defeating to turn our preferences and wants into absolute necessities. People who think in this manner tend to overreact with strong negative emotions of anger, depression and fear, when things or people are not necessarily the way they are expected to be.

External as well as internal stimuli may trigger our emotional responses. It is easier to identify the external events and situations that influence our emotional states and resulting behavior but it is more difficult at time to identify the source of internal distress. At a time or other, all of us may have felt anxious or 'down in the dumps' without knowing why.
When our emotions are stirred up the resultant physiological arousal is obviously noticeable. Many parts of the body are involved in emotional arousal. Psychophysiologists consider the nervous system and endocrine system as especially significant in producing the physiological arousal that is identified with emotions.

Increased activity of the sympathetic nervous system helps the body in dealing with threatening situations like an emergency reaction or the flight or fight response. In contrast to the emergency reaction the pattern of bodily response during relaxation includes decreased activity of the sympathetic and somatic nervous system with increased parasympathetic activity. This is the maintenance system of the body, which is responsible for conservation and replenishment of energy. Both of them are parts of autonomic nervous system. One part, the sympathetic system, is active during arousal states and prepares the body for extensive action by increasing the heart rate, raising blood pressure, increasing the blood sugar level and raising the levels of certain hormones in the blood. This part of autonomic nervous system is active while we experience strong emotions such as fear and anger.
The other part parasympathetic of the autonomic nervous system tends to be active when we are calm and relaxed. It helps to build up and store the body's energy. For example, it decreases the heart rate, reduces the blood pressure and diverts blood to the digestive system. In aroused emotional states, sympathetic activity dominates, in calm state, parasympathetic activity is more prominent. But both systems can be active in many emotional states; for example in anger, heart rate increases, a sympathetic effect and so do digestive activity a parasympathetic effect. Over stimulation of the endocrine glands and the nervous system results in the impairment of physiological functioning expressed in terms of somatic malfunctioning.

This relationship between mind and body has fascinated philosophers and scientists throughout history. It was believed that person's mental state and physical activities were parts of an individual whole. The prevailing cultural model defining the relationship of body to consciousness tends to be reflected in disease model. Consciousness, feelings and thoughts have been conceived of an epiphenomena of physical process. In historical perspective, these hypothetical constructs formed the foundation of psychosomatic diseases and medicine. Now the balance has shifted from
constitutional and genetic factors towards the recognition of psychogenetic factors in mental and physical disorders. Today exciting research in psychoimmunology, neuroendocrinology, and neurophysiology is encouraging us to take a new look at the mind-body relationship, particularly at the issue of how psychological stress can cause pathological changes in body functions. Stress produces not only compensatory behaviours but emotional and physiological reactions as well. It contributes to change in body functions, which if intense or chronic may lead to disease. Meyer (1958) long back argued that alteration in social circumstances and behavioural patterns have potential influence on the balance in health and illness. The psychophysiological studies established that natural or induced stress evoke significant alterations in the functioning of most bodily tissues, organs, and systems. These changes in turn lead to a lowering of the body's resistance to disease. The greater the magnitude of such stressful life events, the greater the risk of acquiring of illness of serious nature (Holmes, 1974, Rahe, 1964, 1968). By engaging important integrative system of the body, stress can cause disease by: lowering of immune response; creating endocrine problem; altering the balance of autonomic control; altering sleep pattern with attendant impact on protein metabolism, hormone secretion, and other vegetative functions; changes in
peptide release in extra CNS sites; and affecting neurotransmitter, neuromodulator, and neuroendocrine functions of brain.

In numerous studies a positive relationship has been noted between psychological and physical stress and a variety of psychological and somatic disorders. Stress researchers in India as well as abroad have reported significant positive relationship between psychological stresses experienced by people in their different life domains and various symptoms of psychosomatic disorders. A variety of somatic problems, particularly psychosomatic disease, have been observed to be the outcomes of severe stresses experienced by people in their physical environment and their social and occupational life domains. In some investigations, even cancer has been reported to be an outcome of the biochemical reactions to the situations of severe stress.

Jons F.N et.al 1956 described psychosomatic as 'Psyche' and 'Soma'. the Greek words meaning the mind and the body respectively. So psychosomatic disease are those diseases which, while they have their origin in the psyche, are clinically diagnosed through somatic symptoms manifested in the body. They are now also called stress diseases expressed through psychophysiological reactions. In simple words, they are mind to body problems, which have simultaneous
interaction and mutual influence. Generally, it is believed that emotional effects, caused by the stress and tension of modern life, are translated into somatic disorders such as coronary heart disease, hypertension, diabetes, peptic ulcer, insomnia, and disorders of the digestive system, etc. At least 72 percent of diseases in metropolis cities are psychosomatic disease or stress diseases, associated with mental or emotional disturbances.

Keeping in view the objectives of the study it is pertinent to define and describe the psychosomatic disorders under taken in the study.

**Coronary Heart Disease:**

Coronary heart disease has been defined as impairment of heart function due to inadequate blood flow to the heart, compared to its needs, caused by obstructive changes in the coronary circulation to the heart. Studies have identified, several 'risk' factors e.g. raised serum cholesterol (L.D.L.), hypertension, diabetes, physical inactivity, obesity, and continuous stress condition.

Today, there is a vast body of evidence showing a triangular relationship between habitual diet, blood cholesterol-lipoprotein levels and CHD and, that there relationship are judged to be causal one (WHO 1982 Techn. Rep). There is no population, in which CHD is
common, that does not also have a relatively high mean level of cholesterol (i.e. greater than 200 mg % in adults.)

Study shows that risk of CHD rises steadily with the serum cholesterol concentration. The 10 years' experience of the seven countries study showed that serum cholesterol concentration is an important risk factor for the incidence of CHD at levels perhaps 220 mg % or more. (Kannel, W.B. (1976). Am. J. cardiol., 37: 269).

When we look at the various types of lipoproteins, it is the level of low-density lipoprotein (LDL) cholesterol that is most directly associated with CHD. While very low-density lipoprotein (VLDL) has also been shown to be associated with premature atherosclerosis, it is more strongly associated with peripheral vascular disease (e.g., intermittent claudication) than with CHD. High-density lipoprotein (HDL) cholesterol is protective against the development of CHD-the higher its mean level in a group of individuals, the lower the incidence of infarction in that group. HDL should be more than 30 mg %.

To further define CHD risk prediction based on serum lipid levels, a total "Cholesterol HDL ratio" has been developed. A ratio of less than 3.5 has been recommended as a clinical goal for CHD prevention (Gordon, T. etal 1977. Am. J. med, 62: 707) The normal
value of LDL is 80 - 170 mg%, The normal value of HDL is 30 - 70 mg %.

The blood pressure is the single most useful test for identifying individuals at a high risk of developing CHD. Hypertension accelerates the atherosclerotic process, especially hyperlipidemia is also present and contributes importantly to CHD. In the past, emphasis was placed on the importance of diastolic blood pressure. Many investigators feel that systolic blood pressure is a better predictor of CHD than is the diastolic. However, both components are significant risk factors. The risk role of "Mild" hypertension is generally accepted (WHO 1985 Primary prevention of CHD EURO Dep and studies 98. copenhagen).

The risk of CHD is 2-3 times higher in diabetics than in non-diabetics. CHD is responsible for 30 to 50 percent of deaths in diabetics over the age of 40 years in industrialized countries. WHO (1985) Techn. ReP. Ser 727.

Sedentary life-style is associated with a greater risk of the development of early CHD. This evidence that regular physical exercise increases the concentration of HDL and decreases both body weight and blood pressure which are beneficial for cardiovascular health, (Miller, N.E. et. al.1979. Lancet 1:11)
Type A behavior is associated with competitive drive, restlessness, hostility and a sense of urgency or impatience. Type A individuals are more CHD prone than the calmer. (Jenkins, C. D. et.al. (1974) N. Eng. J. Med., 290 1271.)

Hypertension:

Hypertension refers to high blood pressure, both systolic and diastolic. At the time when heart contracts the blood is pumped into arteries with a particular pressure known as systolic pressure, whereas when heart relaxes or comes back to its original shape the blood pressure in the arteries drops down to a particular level which is known as diastolic pressure. The ideal pressure is 120/80 mmHg possible completely at rest and free from tension range. An individual is said to suffer from hypertension if the blood pressure is persistently above 150/90 mmHg. However the aim of treatment is to have blood pressure below 140-90 mmHg.

Hypertension is of two types primary and secondary. Primary hypertension is also called essential or idiopathic No specific cause for the rise of blood pressure is detected. The essential hypertension is associated with continuous tension, mental strain or anxiety. Primary hypertension is thus a stress disorder. In the present day of world, the chances of being under continuous strain are pretty high
for each one of us due to fast, uncertain, crowded and tense way of
daily life. Filled as it is with conflict, competition, unkindness and
cruelty. That is why the incidences of hypertension and more serious
heart ailments are extremely high today, as compared to the days of
our ancestors, two or three generations ago, secondary hypertension
is caused as a side effect of major disease of other organs like
kidneys endocrine glands or brain.

Diabetes Mellitus:

It is a devastating medical condition-affecting people of all
ages, genders, and nationalities. Diabetes is the inability to bring
glucose from the blood to the cells. This abnormality is due to either
a decrease in the production of insulin by pancreas or an
insensitivity of cells to respond to the insulin present.

Stress and anxiety for imaginary reason, fear from unknown
source and above all sedentary urban life style aggravates this
disease among the urban population.

Normally, the blood glucose level is 90 to 110 mg% . The blood
sugar levels of diabetes patients are abnormally high ranging from
above 150 mg% to 300 mg% in mild cases. In extreme cases it may
go up to 800 mg%.
Peptic ulcer:

Peptic ulcer is defined as disruption of the mucosal integrity of the lower end of esophagus, stomach and/or duodenum due to hypersecretion of acid and pepsin leading to a local defect. In peptic ulcer personality there are psycho-physiologic gastro-intestinal reactions to life situations. It is said that a feeling of strong resentment, sustained hostility and anxiety (due to parasympathetic over compensation) results in a perceptible increase of acid production (HCL) which eats away the stomach lining or the lining of the duodenum, or lower end of esophagus leaving a kind of wound. (Asif Golwalla F. 1997).

Insomnia:

It is a psychophysiological disorder in which there is a preoccupied perception of inability to sleep at night, initially triggered by stressful event and mostly due to anxiety and unpleasant emotions going out of hand. Shocking news, situations causing disappointment and frustration of desire, fear of loosing money, prestige or position, or strain of work over long periods may cause insomnia by constantly stimulating the wakefulness center in the hypothalamus and the reticular system of the brain. When disturbing factors keep on influencing one's mind one cannot sleep well.
Several attempts have been made in the past to show the relevance of yoga in psychotherapy (e.g., Ajaya, 1983; Coster, 1934; Rao, 1995; Vahia, 1969; Watts, 1961). However a system of psychotherapy based on yoga is yet to be formulated and practiced. The increasing popularity of yoga in the treatment of psychosomatic disorders both in mainstream medicine and in alternative medical circles and the interest of psychologists in meditation and yogic relaxation methods, necessitate a close examination of the conceptual framework and repertoire of practices of yoga for their relevance to psychotherapy.

The practice of Hatha yoga had proved to be of great help in the treatment of certain ailments as shown by scientific investigations carried out in India and elsewhere. It is a way of achieving perfect health of all parts of the body and influencing breathing and other functions going in it and through them bringing a perfect harmony in mental and physical activity. It helps to prepare a healthy body and mind in such a way that a necessary equilibrium is established in over all functions. (Hatha Yoga, Rarmacharaka yogi 1977).

Yogic asanas involve symbolism and body language. The characteristic feature of asanas is that several of them involve
stretching of the musculature and exerting pressure or squeezing of the bodily parts, providing exercise to the joints, muscles and internal organs. There are specific asanas to selectively exercise chosen areas and organs of the body. Asanas contribute to the health and vigor of the whole body. Both the voluntary and involuntary systems of the body are exercised in asana practice.

In practicing asanas attention is paid to the sensation generated by the movement as well as to the stillness. Coordination of breath with movement is also emphasized. As a result body awareness increases and the practitioners become sensitive to the inner processes (Jhansi Rani & Rao, 1994).

As emotions often reflect in the body, asanas provide a means to deal with the emotional blocks and characterological muscle tensions. A regular practice of asanas may be helpful to change the dispositions and attitudes that lead to maladjustment in the life. For example, posture of strength (vajrasana), posture of attainment (siddhasana), posture of a hero (dhirasana) among others, may help to bring about a change in the attitudes of the individual. Relaxation postures such as shavasana and makarasanas, and asanas that involve concentration on specific muscle groups of the body may help to overcome tensions and restlessness. Yogic relaxation postures have
already been found in systematic research to reduce anxiety, psychosomatic complaints and repressed emotionally (e.g., Ajaya, 1984, Patel, 1973, Vahia, 1973, Neurenberger, 1981).

In his foreword to B.K.S. Iyengar's Light on Yoga, Yehudi Menuhin (1964) observed that yoga induces in the practitioner a primary sense of measure and proportion. It refines and animates every cell of the body unlocking and liberating capacities such as strength of will, impetus, ambition and tenacity. Yoga is ideally suited to prevent physical and mental illness and to protect body, generally developing an inevitable sense of self-reliance and assurance. According to yoga once the mind becomes calm and steady, clarity improves and person becomes more aware of the forces which bring about disturbances. He is thus mentally better equipped to deal with any situations with a tranquil mind. He remains unperturbed in difficult situations, even when the external factors have not changed.

According to Swamy Ajaya (1983), who first dealt with asanas at length for their relevance to psychotherapy noted that the asanas have all the properties of modern psychophysical disciplines such as bioenergetics, chiropractice, rolfing and massage therapy.
There is also little doubt that proper habitual exercise training program is a significant factor in reducing the severity of psychosomatic disorders. The coronary artery disease graph from 1960 had steadily declined to 25% and it is believed to be due to a combination of improvement of treatment and primary prevention program. Which includes exercise (Fox, Bower & foss 1989). Many studies have been conducted to infer that exercise and CHD are related. One of the first studies to infer that exercise and CHD are related was done in 1953 in England on groups of bus drivers and bus conductors. The result showed that the incidence of heart disease in the sedentary bus drivers was twice that of the more active bus conductors. While the drivers sat most of their working day, the conductors walked up and down the double-decker buses. Since this study nearly 35 years ago, many similar studies using different groups of subjects have come to same conclusion: that the risk of heart attack is less the more physically active you are.

Recent researches has shown that exercise not only lower total blood cholesterol but also increases the fraction of cholesterol known as HDL which is protective against CHD as it do not collect or adhere to the inner linings of arteries. Infect it help in breaking down the fatty deposits already present. The fatty artherosclerotic deposits
are composed of LDL and VLDL, these are decreased by long term aerobic exercise.

High blood pressure or hypertension is another risk factor associated with coronary heart disease. An individual with a systolic blood pressure of 150 mmHg has over twice the risk of CHD than does someone with a pressure below 120 mmHg. Habitual exercise has been shown to be effective in reducing blood pressure to nearly normal values (Fox, Bowers and Foss 1989).

Infact the 1984 data of Paffenbarger and colleagues suggested that physical activity benefits may not be limited to the primary prevention of coronary heart disease. They show that persons who exercise also have a lower incidence of stroke, respiratory disease, all cancers and deaths from all causes than persons who do not exercise. A more recent report about this subject group indicates that exercise participation lengthens life span.

"Exercises are divided into aerobic and anaerobic groups. Anaerobic physical activity is done in the absence of O₂ where as aerobic physical activity is done in the presence of sufficient oxygen for metabolic reactions.

Aerobic activity is usually exercise done with intensity, hard enough to achieve the target heart rate of 60% to 65% of one's
maximum heart rate and one's metabolic rate is between 50% to 60% of max \( \text{vo}_2 \) for prolonged periods of times. During which constant supply of \( \text{O}_2 \) is maintained by the circulatory system to the working muscles in order to metabolise carbohydrates and fats for the production of energy. Thus during aerobic activity, the heart, lungs and blood vessels supply \( \text{O}_2 \) and nutrients to the muscle cells to meet the demand of long duration physical activity. Because of the importance of the total fitness effect and the fact that it is more readily attained in aerobic exercise programs and also because of the potential hazards and compliance problems associated with high intensity anaerobic activity lower to moderate intensity of longer duration aerobic activity is recommended for the non athletic individuals.

After thoroughly reviewing the available literature, we have come to the conclusion that several studies had been conducted to ascertain the effect of yoga and exercise separately on psychosomatic disorders separately, but not much studies on combined effect of yoga and exercises on psychosomatic disorders had been carried out till now. The purpose of this research was to place the role of yoga and exercise jointly and individually in controlling significantly the
psychosomatic disorders based on a distilled and detailed interpretation of the gathered data.

The Statement of the Problem:

The statement of the problem is "Comparative effect of aerobic exercises and selected yogic practices on the psychosomatic disorders."

Hypothesis:

Keeping in view the objectives of the study following hypotheses were formulated:

1. **It is hypothesised that Yogic and Aerobic exercise programmes would significantly medicate the psychosomatic disorders.**

2. **It is hypothesized that Yogic programme would be more effective than Aerobic exercise programme in medicating the psychosomatic disorders.**

3. **It is further hypothesized that a Combined Aerobic-Yogic exercise programme would be more effective in medicating psychosomatic disorders than the individual programmes of Yoga and Aerobic exercise.**
Limitations:

1. The variation in the age group of subjects might have some infringement on the findings of our study.

2. Though every effort was made to control dietary and living habits but even than some minor variation in them might have created some infringement on the findings.

3. Though it was intended by us to keep a control group, which was not to be subjected to any experiment programme, but we could not manage the control groups. As all the subjects of control group withered away in search of other treatments. Therefore for inferring the level of improvement in the chosen variable of various psychosomatic disorders we had also used paired t-test to determine significance of difference between pre and post test means along with analysis of variance and covariance.

Delimitation:

1. The study was delimited to the subject of both sexes with age group ranging from 20 to 50 years.

2. The study was delimited to selected Psychosomatic disorders
   (a) Coronary heart disease (LDL, HDL)
   (b) Hypertension
(c) Diabetes
(d) Peptic ulcer
(e) Insomnia

3. The Study was delimited to specific yogic programme including asanas, pranayam, kriyas, yog nidra, and Transcendental Meditation Techniques.

4. The Study was delimited to selected aerobic exercises programme of 35 to 60 minutes. The intensity of the programme was set on a point, where by the heart rate of the subject was between 50-60 % of his maximum heart rate.

Significance of the Study:

The significance of the study lies in finding out the medication of psychosomatic disorders through yoga and physical activity. The study will help us to know the effect of yoga and aerobic activity in improving somatic functioning of the individual by relieving his various psychiatric disorders. It will also helps in establishing the relationship between one psyche and his organic functional activity.
Chapter 2
Review of Related Literature
Review of the Related Literature

The research scholar has gone through related literature available, which are relevant to the present study. The relevant studies found through various sources, which the research scholar has come across, are enumerated below.

Mahajan AS and Reddy KS (1999) studied the effect of yogic lifestyle on the lipid status in angina patients and normal subjects with risk factors of coronary artery disease. The parameters included the body weight, estimation of serum cholesterol, triglycerides, HDL, LDL and cholesterol-HDL ratio. A base line evaluation was done and then the angina patients and risk factors subjects were randomly assigned as control (n=41) and intervention (yoga) group (n=52). Lifestyle advice was given to both the groups. An integrated course of yoga training was given for four days followed by practice at home. Serial evaluation of both the groups was done after fourth tenth and fourteenth weeks. Dyslipidemia was constant feature in all cases. An inconsistent pattern of change was observed in the control group of angina (n=18) and risk factor subjects (n=23). The subject practicing yoga showed a regular decrease in all lipid parameters except HDL. The effect started from four weeks and
lasted for 14 weeks. Thus, the effect of yogic lifestyle on some of modifiable risk factors could probably explain the preventive and therapeutic beneficial effect observed in coronary artery disease.

Karambelkar, P.V. et.al, (1977) observed a reduction of mean cholesterol level in 22 males and 10 females at the end of three weeks training in yogic physical culture. The reduction was not significant in the case of females. No significant changes were observed in weight, body fat percentage and skin fold.

Manchanda Sc. et.al, (2000) studied the effect of yoga on coronary artery disease (CAD). In this prospective, Controlled clinical trial, 42 men with angiographically proven CAD were randomized to control (n=21) or yoga (n=21) intervention and were followed for 1 year. The active group was treated with a user-friendly programme consisting of yoga control risk factors, diet control and moderate aerobic exercise. The control group was managed by conventional method (risk factors control and American heart Association step 1 diet). After 1 year, the yoga group showed significant reduction in number of anginal episodes per week, improved exercise capacity and decrease in body weight. Serum total cholesterol, LDL cholesterol and triglyceride level, also showed greater reductions in comparison with the control group.
Revascularization procedures (coronary angioplasty or bypass surgery) were less frequently required in the yoga group (one versus eight patients, RR, 5.45, P=0.01) coronary angioplasty repeated at one year showed that significantly more lesions regressed (20% versus 2%) and less lesions progressed (5% versus 37%) in the yoga group (chi-square 24.9, P<0.0001) Compliance to the total programme was excellent No side effects were reported Thus at the end of this study it was concluded that yogic lifestyle intervention retards progression and increase regression of coronary atheroescerosis in patients with severe CAD It also improves symptomatic status, functional class and risk factors profile

Wood, P D et al, (1979) conducted the study to determine the effect of exercise on plasma high-density lipoproteins, and other Lipids In this study the subjects were active men, aged 35-49 years, who averaged 39 miles of running per week The non-runners who served as the control group were of the same age span but did not exercise on a regular basis Whereby it was observed that Chronic exercise training causes decrease in total blood cholesterol, triglycerides and low-density lipoprotein (LDL cholesterol) concentrations, and an increase in high-density lipoprotein (HDL
cholesterol) concentration in both men and women. While, there was no significant reduction of LDL in control group.

Wannamethee SG. et.al, (2000) studied the relations between physical activity, types of physical activity and all cause mortality in men with established coronary heart disease CHD. Where by in 1992, 12 to 14 years after the initial screening (Q1) of 7735 men 40 to 59 years of age from general practices in 24 British towns, 5934 (91% of available survivors mean age 63 years). Provided further information on physical activity (Q92) and were followed up for 5 years; 963 had a physician's diagnosis of CHD (myocardial infraction or angina). After exclusions, there were 772 men with established CHD, 131 of whom died of all causes. The lowest risks for all-cause, and cardiovascular mortality were seen in light and moderate activity groups (adjusted relative risk compared with inactive occasionally active: light, 0.42 (0.25, 0.71); moderate, 0.47 (0.24,0.92) and moderately vigorous/vigorous 0.63 (0.39,1.03). Recreational activity of >/= 4hours per weekend, moderate or heavy gardening, and regular walking (>40 min /d). Were all associated with a significant reduction in all cause mortality. Non-sporting activity was more beneficial than sporting activities. Men sedentary at Q1 who began at least light activity by Q92 showed lower mortality rates on follow-up
than those who remained sedentary (relative risk 0.58, 95% CI 0.33 to 1.03 P = 0.06). Finally it was concluded that, light or moderate activity in men with established CHD is associated with a significantly lower risk of all cause mortality. Regular walking and moderate or heavy gardening were sufficient to achieve this benefit.

MC Common MR and Israel RG (1994) conducted a study on the effect of exercise training on absolute and relative measurement of regional adiposity, showed that the training programme significantly increased HDL and decreased triglyceride and total cholesterol minus HDL. The training period was (30-45 min /days / weeks) of 14 week.

Jennings GL (1995), observed that there are direct effects of regular exercise on blood pressure and lipid profiles. The changes vary according to the level and duration of increased physical activity.

Blackwell.B.et. al, (1976) conducted a study to determine the effect of transcendental meditation on hypertension. Seven selected hypertensive patients were stabilized on drugs at a research clinic. Subjects learned transcendental meditation (T.M.), were seen weekly, and took their own blood pressure several times daily. After 12
weeks of T.M. six subjects showed psychological changes and reduced anxiety scores. Six subjects also showed significant reductions in home and four in clinic blood pressures. Six month later four subjects continued to derive psychological benefit and two showed significant blood pressure reductions attributable to T.M. at home and clinic.

Choquette, G, et.al, (1973) observed in the their study that the blood pressure at rest as well as during exercise was reduced to normal, following 6 months of exercise training of the subjects, who were considered borderline hypertensives.

K.S. Joshi (1978) conducted a study to determine the effect of pranadharana on 25 patients of hypertension and 18 patients of insomnia. The patients were asked to apply the mind to the breathing process, making it smooth, rhythmic and effortless. While breathing in and out they were asked to be aware of the sound 'aum' just feeling it without uttering the word. No other mantra or japa was introduced. Each such session of paranadharana lasted nearly half an hour every day for seven consecutive days. Statistical analysis of pre and post experiment data revealed that respiration per minute, systolic blood pressure and pulse rate had been significantly reduced after the treatment by meditation, while PGR had shown a significant increase.
The brain waves showed a significant decrease in frequency and amplitude. The number of sleep hours had significantly increased.

Murugesan R., et.al, (2000) conducted a study to determine the effect of selected yogic practices on the management of hypertension. Thirty-three hypertensives, aged 35 to 65 years were examined with four variables including systolic and diastolic blood pressure, pulse rate and body weight. The subjects were randomly assigned to three groups: a yoga group, a group who received medical treatment by the physician of the hospital and a control group. Yoga was offered in the morning and in the evening with 1 hr/session for 11-weeks. Medical treatment comprised drug intake every day for the experimental period. The result of pre-post test revealed that both the treatment stimuli (i.e. yoga and drug) were effective in controlling the measures of hypertension.

Patel, C. et.al, (1975) conducted a study to determine the effect of yoga and bio-feed back on hypertension. 34 patients were assigned at random either to six weeks of yoga methods with biofeedback or to general relaxation. Both groups showed a reduction in blood pressure, although the decrease was significantly greater for the yoga group. The control group was then trained in yoga relaxation and their blood pressure fell to that of the other group (now used as control).
Desai, B.P (1983) observed a significant reduction in serum lipase activity of diabetes patients at the end of yogic treatment of seven weeks.

Rich Edwards J.W. et. al. (1999) studied the effect of walking and other vigorous physical activity on type 2 diabetes in woman. During 8 years of follow up (534,928 person - years), where 1419 incident cases of types 2 diabetes were documented. After adjusting for age, smoking, alcohol use, history of hypertension, history of high cholesterol level and other covariates, the relative risks (RRs) of developing type 2 diabetes across quintiles of physical activity (least to most) were 1.0, 0.77, 0.75, 0.62 and 0.54 (P for trend < .001); after adjusting for body mass index (BMI), RRs were 1.0, 0.84, 0.87, 0.77 and 0.74 (P for trend = .002). Among women who did not perform vigorous activity, multivariate RRs of type 2 diabetes across quintiles of MET score for walking were 1.0, 0.91, 0.73, 0.69, and 0.58 (P for trend < .001). After adjusting for BMI, the trend remained statistically, significant (RRs were 1.0, 0.95, 0.80, 0.81, 0.74, P for trend = 0.01). Faster usual walking pace was independently associated with decreased risk. Equivalent energy expenditures from walking and vigorous activity resulted in comparable magnitudes of risk reduction. Thus it was concluded that greater physical activity
level is associated with substantial reduction in risk of type 2 diabetes, including physical activity of moderate intensity and duration.

Wannamethee S.G. et.al, (2000) conducted a study to examine the role of non-fasting serum insulin level and components of the insulin resistance syndrome in the relationship between physical activity and the incidence of coronary heart disease and type 2 diabetes. It was a prospective study of 5159 men aged 40 to 59 years with no history of coronary heart disease, type 2 diabetes or stroke drawn from general practices in 18 British towns. During an average follow-up period of 16.8 years, there were 616 cases of major coronary heart disease events (Fatal and nonfatal) and 196 incident cases of type 2 diabetes. After adjustment for potential confounders (Lifestyle characteristics and pre-existing disease), results showed that physical activity was inversely related to coronary heart disease rates, with the lowest rates in the men undertaking moderate physical activity and with no further benefit thereafter. For type 2 diabetes, risk decreased progressively with increasing levels of physical activity. Physical activity was associated with hyperuricemia, diastolic blood pressure and high-density lipoprotein, cholesterol level, and with gamma-glutamyltransferase level, a possible marker of
hepatic insulin resistance. Adjustment for insulin and associated factors made little difference to the relationship between physical activity and risk of coronary heart disease. By contrast, these factors together with gamma-glutamyltransferase level appear to explain a large proportion of the reduction in risk of type-2 diabetes associated with physical activity. In the end it was concluded that the relationship between physical activity and type-2 diabetes appears to be mediated by serum true insulin level and component of the insulin resistance syndrome. However, these factors do not appear to explain the inverse relationship between physical activity and coronary heart disease.

Jain SC et.al, (1993) Investigated the changes in blood glucose and glucose tolerance by oral glucose tolerance test (OGTT) after 40 days of yogic therapy in 149 non insulin-dependent diabetics (NIDDM). The response to yoga in these subjects was categorized according to a severity scale index (SST) based on area index total (AIT) under OGTT curve. One hundred and four patients showed a fair to good response to yoga therapy. There was a significant reduction in hyperglycemia and AIT with decrease in oral hypoglycemia and AIT with decrease in oral hypoglycemic drugs required for maintenance of normoglycemia. It was concluded that
yoga, a simple and economical therapy, could be considered a beneficial adjustment for NIDDM patients.

Cheng. Y. et.al, (2000) conducted a study to investigate the role of physical activity on the incidence of peptic ulcers disease. Although Helicobacter pylori has been identified as a major cause of chronic gastritis, not all infected patients develop ulcers, suggesting that other factors such as lifestyle may be critical to the development of ulcer disease. The participants were men (n=8,529) and women (n=2,884) who attended the cooper Institute for Aerobics Research Dallas, Texas, between 1970 and 1990. The presence of gastric or duodenal ulcer disease diagnosed by a physician was determined from a mail survey in 1990. Participants were classified into 3 physical activity groups, according to information provided at the baseline clinic visit (before 1990): active, those who walked or ran 10 miles or more a week; moderately active, those who walked for less than 10 miles a week or did another regular activity; and the referent group consisting of those who reported no regular physical activity. Results: with the use of gender-specific proportional hazards regression models, that could be adjusted for age, smoking, alcohol use, body mass index, and self-reported tension. active men had a significantly reduced risk for duodenal ulcers (relative hazards
[95% confidence interval] for the active group, 0.38 [0.15-0.94], and 0.54 [0.30-0.96] for moderately active group). No association was found between physical activity and gastric ulcers for men or for either type of ulcer for women. Thus it was concluded that physical activity may provide a non-pharmacologic method of reducing the incidence of duodenal ulcers among men.

Gharote, M.L. (1971) studied the effect of air swallowing on the gastric acidity. Decrease in free, combined and total acidity was found after air swallowing in 3 subjects at 0, 1/2 and 1 hour. However, the initial values showed the subjects to be hyperacidic.

A 6 month study with crossover at 3 months was designed by T. Dale (1979) to evaluate the possible beneficial effects of transcendental meditation upon peptic ulcer, 21 patients kept daily diaries of symptoms and medications and answered questionnaires at the end of the study 6 months later, other measurements including physician evaluation endoscopic testing. The results indicated that transcendental meditation is a useful adjunct in treating peptic ulcer.

Desai, B.P. and Bhole, M.V.(1982) conducted a study to determine the effect of yogic treatment on gastric acidity. Gastric acidity was found to decrease in hyperacidic patients after six weeks
of yogic treatment and more number of patients were seen to come in the normal range.

Muller popkes and Hajak (1996) conducted a study to determine the effect of psychotherapy and progressive relaxation technique on insomnia. 25 patients were treated in 12 individual session either with 1PT-1 or with progressive relaxation technique. Results shows that patients from both the groups showed significant improvement of total sleep time, sleep efficiency and wake after sleep onset.

Jacobs G.D. et al. (1993) Conducted a study to determine the effect of multi-factor behaviour intervention consisting of stimulus control and relaxation-response training (n=10) compared to stimulus control alone (n=10) for sleep-onset insomnia. Only the multi-factor subjects mean post-test sleep latency fell with in the good sleeper range. They also exhibited a 77% improvement on mean sleep-onset latency compared to the stimulus control group (63%). Thus, a multi-factor intervention may be more effective then stimulus control alone for treatment of sleep-onset insomnia.

Kocher, H.C.(1976) carried out a study to determine the effect of yogic practices on mental fatigue. He found that there was
significant improvement in overall performance of the mental work, in 32 subject after 3 week of training in yogic physical culture.

Kocher, H.C. and Pratap, V. (1971) observed significant reduction in total neurotic trend in 39 males and 9 females at the end of 3 week of training in yoga.

Bera, Gore and OAK. (1998) Compared the recovery from stress induced physiological stress in Shavasana (a yogic relaxation posture) and two other postures (resting in chair and resting supine posture). 21 males and 6 females (21-30 yrs) were allowed to take rest in one of the above posture immediately after completing a scheduled treadmill running. The recovery was assessed in term of heart rate (HR) and blood pressure (BP). HR and BP were measured before and every two minute after treadmill running until they returned to initial level. The results revealed that effect of stress was reversed significantly in shorter time in shavasana, than compared to the resting posture in chair and in a supine posture.

Sahasi.G, et.al (1989) Evaluated the efficacy of selected yogic practices (group1, N=38) as compared with drug (diazepam) therapy (group2, N=53) in anxiety-neurotic outpatients (aged 18-47 years). Subjects were administered a battery of tests, pre-and post-treatment.
Data obtained indicated a significant rate of improvement in group 1 Ss. who completed the prescribed length (5 days/week for 3 months) of yoga practices as compared with group 2 Ss. At least 7% of group Ss were reported to be completely asymptomatic as compared with none of the group 2 Ss.
Chapter 3

Procedure
Procedure

The review of related literature in the preceding chapter has given direction in explicitly explaining the objectives of the study and in selecting the methods to be adopted for carrying out the research. In this chapter the selection of subjects, criterion measures and methods employed for collecting them, experimental design, preparation of yogic and aerobic programmes, administration of these programmes, collection of pre and post data and statistical techniques used for its analysis have been described.

Selection of Subjects:

For the purpose of this study 60 subjects (male and female) of each psychosomatic disorder (coronary heart disease, hypertension, diabetes mellitus, peptic ulcer, insomnia) undertaken in the study were selected from various parts of Aligarh and particularly from Adarsh swastha kendra Aligarh and Yoga and naturopathy centre Aligarh. The age group of subjects ranged between 20 to 50 years. Majority of the subjects were educated and employed in different kinds of jobs or were in their private professions.
Criterion Measures and methods employed for collecting them:

Keeping in view the objectives of the study following criterion measure were set of the psychosomatic disorders under taken in the study and collected in the following way.

1. **Coronary Heart Disease:** The pre disposing factors of CHD are mainly increased LDL and decreased HDL levels in blood cholesterol. Increased LDL levels in the blood serum initiates the chances of CHD. In contrary to this increase in HDL levels in the blood serum decreases CHD occurrence. Fasting blood was collected in the morning and analysed in the laboratory for determining serum HDL and LDL levels in mg%.

2. **Hypertension:** For measuring hypertension systolic and diastolic blood pressures in mmHg of the subjects were measured in the morning with sphygmomanometer and stethoscope. Subject was made to sit in resting position and the cuff of the sphygmomanometer was wrapped around the upper arm. The stethoscope was placed lightly over the bronchial artery in the cubital fossa. The pressure was increased in the cuff up to 30 mmHg above the level at which radial pulsation can no long be felt. Then, the pressure was lowered in the cuff
to 5-mmHg at a time until the first sound of beat was heard. This was the systolic blood pressure, which was recorded. The pressure was lowered further in the cuff, until the sound became suddenly faint or inaudible. This was diastolic pressure, which was recorded.

3. **Diabetes Mellitus:** It was determined by taking into account the fasting blood glucose levels in mg%. Subject's blood in the morning was collected and analysed in the laboratory for blood glucose levels.

4. **Peptic Ulcer:** Responses related to peptic ulcer were collected through two methods:
   
   a. **Clinical diagnosis** (for 36 subjects suffering from less than two years)
   
   b. **Endoscopic diagnosis** (for 24 subjects suffering from more than two years)

a. **Clinical Diagnosis**

To objectively evaluate the clinical features associated with peptic ulcer, a questionnaire was constructed under the expert guidance of Dr. Ritanjay Sharma MBBS M.D. Pathology with utmost care. The minute clinical details related to peptic ulcer were taken into consideration in order to get maximum worth
while responses from the subjects. Their responses in relation to intensity were graded from 0 to 2. Questionnaire containing following questions along with ratings is given below.

1. What is the intensity of epigastric pain?
   (a) Nil  (b) Moderate  (c) Severe
   0 1 2

2. Pain after taking food.
   (a) Nil  (b) Decrease  (c) Increase
   0 1 2

3. Feeling of nausea or vomiting.
   (a) Nil  (b) Moderate  (c) Severe
   0 1 2

   (a) Nil  (b) Moderate  (c) Severe
   0 1 2

5. Pain after spicy food.
   (a) Nil  (b) Moderate  (c) Severe
   0 1 2

   (a) Nil  (b) Moderate  (c) Severe
   0 1 2

7. Weight loss.
   (a) Nil  (b) Moderate  (c) Severe
   0 1 2

8. Hemostasis (coffee coloured vomiting)
   (a) Nil  (b) Moderate  (c) Severe
   0 1 2
9 Melena (black coloured stool)
   (a) Nil    (b) Moderate    (c) Severe
   0         1             2

10 In physical examination the epigastric tenderness
   (a) Nil    (b) Moderate    (c) Severe
   0         1             2

The total of clinical ratings on 10 questions was the intensity of peptic ulcer with which the subject was suffering.

b Endoscopic Diagnosis

Subjects with chronic persistent symptoms from more than two years, were subjected to fibroblastic endoscopic examination under local anesthesia. The findings in relation to the disintegration of mucous membrane of oesophagus, stomach and duodenum were rated in the following manner:

1 Oesophagus
   Integrity of mucous membrane
   (a) Normal    (b) erosion    (c) Ulcerated    (d) Stricture
   0            2             4               6

2 Stomach
   Integrity of mucous membrane
   (a) Normal    (b) erosion    (c) Ulcerated    (d) Stricture
   0            2             4               6
3. **Duodenum**

Mucosal integrity of any part

(a) Normal  (b) erosion  (c) Ulcerated  (d) Stricture

0  2  4  6

The total of these ratings on integrity of mucous membrane of oesophagus, stomach and duodenum was the intensity of peptic ulcer with which the subject was suffering.

3. **Insomnia:**

In the case of patients suffering from insomnia the extent of sleep was measured. For this they were asked to note the number of times they heard the half-hourly sounds of a wall clock from 10 p.m. to 6 a.m. These half-hourly counts were set as the measuring standard of sleep (K.S. Joshi, 1991). The reliability of this test was determined by test-retest method on a group of 15 subjects and the coefficient was 0.86.

**Reliability of Data:**

The instruments and apparatus used for collecting the relevant data were of high scientific standard. All recent methods were used in drawing out the data. The reliability of the apparatus was
determined by test-retest method and the average coefficient was 0.93.

Collection of Pre-experimental Data:

Prior to the administration of the programme a pretest was conducted where two sets of responses were taken for blood pressures, fasting blood glucose, HDL, LDL and insomnia with in a gap of one day and the means of the two responses were deemed as final score. For peptic ulcer only one set of responses was taken as the clinical and endoscopic findings were subjective, which were objectively graded.

Experimental Design:

Except peptic ulcer, each psychosomatic disorder group of 60 subjects on the basis of pre-test data were divided into three almost equated sub groups of 20 subjects each. Peptic ulcer’s 36 clinically rated subjects were divided into three sub groups of 12 subjects each and 24 endoscopic rated subjects into three sub groups of 8 subjects each. All sub groups one were assigned Aerobic exercise programme, subgroups two were assigned Yogic programme and subgroups three were assigned a Combined Aerobic-Yogic programme.

Preparation of experimental programmes:

Aerobic Exercise Programme: Consisted of exercises that included major muscles of the body like slow and fast walking, slow and fast jogging, cycling, calisthenics exercise and stretching exercises. The
intensity of the programme was set on a point, where the heart rate of the subject was between 50-60% of his maximum heart rate. The programme was individualised, depending upon the age, sex and physical status of the individual. The intensity and duration of the programme was gradually increased. The time duration of the programme varied between 35 to 60 minutes.

**Yogic programme:** Yogic programme for each psycho-somatic disorder was prepared separately after taking into consideration the physiological implications of various yogic asanas and kriyas. The time limit of the programme ranged from 1 to 1 and 1/2 hours.

1) **Yogic Programme for Hypertension:**

(a) Selected asanas

1. Shavasana
2. Bhujang asana
3. Shalbhasana
4. Dhanur asana
5. Vajrasana
6. Suptavajra asana
7. Ardhamatsyendra asana
8. Paschimottan asana
9. Pawanmukt asana
10. Gomukh asana
11. Siddhasana
12. Tada asana
13. Makar asana

(b) Pranayam

1. Nadi Shodhan
2. Shitali
3. Sheetkarī
4. Chandra bhaden

   With out kumbhak
Yogic Programme for Coronary Heart Disease:

(a) Selected asanas

1. Shavasana
2. Bhujang asana
3. Shalabhasana
4. Uttanpad asana
5. Dhanur asana
6. Pawanmukt asana
7. Suptvajrasana
8. Paschimottan asana
9. Matsya asana
10. Tada asana
11. Gomukh asana
12. Siddhasana
13. Makar asana

(b) Pranayam

1. Nadi Shodhan
2. Sheetali
3. Sheetkari
4. Ujjai
5. Chandra Bhaden

(c) Yog nidra

(d) Transcendental meditation

Yogic Programme for Diabetes Mellitus:

(a) Selected asana

1. Suryanamskara
2. Shavasana
3. Bhujang asana
4. Hal asana
5. Sarvang asana
6. Shalbhasana
7. Suptavajrasana
8. Dhanur asana
9. Paschimottan asana
(10) Matsya asana (11) Pawanmukt asana
(12) Ardhamatsyendra asana (13) Makar asana

(b) Pranayam
1. Nadi Shodhan
2. Bhastrika
3. Ujjai
4. Bhramarī

In first three months these pranayams were performed without kumbhaka, there after kumbhaka was introduced as per the improvement in the condition of the subject.

(c) Transcendental Meditation

Yogic Programme for Peptic Ulcer:

(a) Selected asanas
(1) Shava asana (2) Shalbha asana (3) Uttanpad asana
(4) Vajra asana (5) Gomukh asana (6) Siddha asana (7) Tada asana (8) Makar asana

(b) Pranayam
1. Nadi Shodhan (Anulam-vilom)
2. Sheetali
3. Sheetkari
4. Ujjai
5. Chandra Bhaden

Without Kumbhaka

(c) Transcendental Meditation

(d) Kunjal With normal cold water, without sal
**Yogic programme for Insomnia:**

(a) Selected asanas

1. Shav asana  
2. Bhujang asana  
3. Sarvang asana  
4. Shalbh asana  
5. Hala asana  
6. Paschimottan asana  
7. Dhanur asana  
8. Matsya asana  
9. Suptavajra asana  
10. Chakra asana  
11. Trikon asana 
12. Pawanmukt asana  
13. Shashank asana  
14. Makar asana

(b) Pranayam

1. Nadi Shodhan (Anulom-vilom)  
2. Bhramari  
3. Ujjai  
4. Chandra khaden

(c) Yog nidra

(d) Transcendental Meditation

**Combined Aerobic-Yogic programme** was prepared in which Yogic programme for respected disorder was mixed with Aerobic programme

1. **Hypertension:** Aerobic programme + Yogic programme for hypertension

2. **Coronary Heart Disease:** Aerobic programme + Yogic programme for CHD
3. **Diabetes Mellitus**: Aerobic programme + Yogic programme for diabetes mellitus.

4. **Peptic Ulcer**: Aerobic programme + Yogic programme for peptic ulcer.

5. **Insomnia**: Aerobic programme + Yogic programme for insomnia.

The time duration of Combined Aerobic-Yogic programme ranged between 1 to 2 hours.

**Administration of the Programme:**

The three programme were administered to the respective three sub groups of each psychosomatic disorder in the two shifts of morning and evening for a period of six months with all wednesdays off in between. The frequency, intensity and time duration of various yogic and aerobic exercises were set after taking into consideration the subject's age, sex and physical status. The intensity and duration of the programme was gradually increased. The subjects were advised to take satvic- bhojan i.e. a normal diet devoid of excess fats and spices. The diet of diabetes and peptic ulcer, subjects was specially monitored during the course of programme in relation to excess sugar, oils and spices. The intake of usual medicines was gradually decreased to finish within two to three months from the starting of
programme, for the subjects who were showing improvement and could maintain without medicines

**Collection of Post experimental Data:**

After the administration of the programmes a post test was conducted. Two sets of responses were collected for blood pressure, fasting blood glucose, HDL, LDL, and insomnia within a gap of one day and the means of two responses were deemed as final scores for the respective psychosomatic disorders. For peptic ulcer only one set of response was collected, as the clinical and endoscopic findings were subjective which were graded objectively.

**Statistical Techniques applied for the Analysis of Data:**

In order to study the effects of three programmes on the psychosomatic disorders, Paired t-test, Analysis of variance and covariance were used. Where F-ratio was significant, LSD test was used to find out which of the groups means differences were most significant.

In analysis of variance the total amount of variation in a set of data is broken down into two types, that amount which can be attributed to chance and that amount which can be attributed to specified causes. There may be variation between samples and also
within sample items. ANOVA consist in splitting the variance for analytical purpose. Hence it is a method of analysing the variance to which a response is subject into its various components corresponding to various sources of variation.

While applying the covariance technique, the influence of uncontrolled variables is usually remove by simple linear regression method and the residual sums of squares are used to provide variance estimates, which in turn are used to make tests of significance. In other words, covariance analysis consists in subtracting from each individual score (Yi) that portion of it Yi that is predictable from uncontrolled variable (Zi) and then computing the usual analysis of variance on the resulting (Y-Yi)'s, of course making the due adjustment to degrees of freedom because of the fact that estimation using regression method required loss of degrees of freedom.

**Level of Significance:** The significance of differences between and among the means was tested at 0.05 level of significance.
Chapter 4
Analysis of Data and Discussion of Findings
Analyses of Data and Discussion of Findings

In this chapter, the analysis of data (measures of the pre and post experimental psychosomatic disorders) and the discussion of the findings is presented. Paired t-test is used to test the significance of difference between the pre and post test means of the three experimental groups and Analysis of variance and covariance is used to test the significance of difference among pre test and post test means of the three experimental groups at 0.05 level of significance. Where the difference is found to be significant LSD test is applied to find out which of the differences between the paired adjusted final means are most significant.

For each of the chosen variables the results are produced below.

Coronary Heart Disease (CHD):

The prominent risk factors associated with CHD are serum LDL and HDL levels, the analyses of data pertaining to LDL and HDL levels in mg% of the three experimental groups is produced below.
Table: 1

PAIRED t-TEST ANALYSIS BETWEEN PRE AND POST TEST
SERUM LDL LEVELS OF THREE EXPERIMENTAL GROUPS

<table>
<thead>
<tr>
<th>Experimental Groups</th>
<th>Pre mean values</th>
<th>Post mean values</th>
<th>Estimated common variance</th>
<th>Calculated 't' values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic group</td>
<td>181.7</td>
<td>161.55</td>
<td>4.43</td>
<td>20.38*</td>
</tr>
<tr>
<td>Yogic Group</td>
<td>183.05</td>
<td>162.2</td>
<td>7.09</td>
<td>13.16*</td>
</tr>
<tr>
<td>Aerobic Yogic Group</td>
<td>182.4</td>
<td>154.35</td>
<td>6.98</td>
<td>17.97*</td>
</tr>
</tbody>
</table>

Each group n=20

* Significant at 0.05 level.

For one tailed test \( t_{0.05} (19) = 1.729 \)

Since all the calculated \( t \)-values in table: 1 are significant, we conclude that all the three experimental programmes are significantly effective in decreasing serum LDL levels.

The pre and post test mean values of serum LDL levels of the three experimental groups is shown in figure: i.
Table 2

ANALYSIS OF VARIANCE AND COVARIANCE OF THREE EXPERIMENTAL GROUPS ON SERUM LDL LEVELS

<table>
<thead>
<tr>
<th>Means</th>
<th>Aerobic group</th>
<th>Yogic group</th>
<th>Aerobic-Yogic group</th>
<th>Sum of squares</th>
<th>Df</th>
<th>Mean sum of square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre test mean</td>
<td>181.7</td>
<td>183.05</td>
<td>182.4</td>
<td>B: 18.23</td>
<td>2</td>
<td>9.11</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 1479.77</td>
<td>57</td>
<td>25.96</td>
<td></td>
</tr>
<tr>
<td>Post test mean</td>
<td>161.55</td>
<td>162.2</td>
<td>154.35</td>
<td>B: 759.24</td>
<td>2</td>
<td>379.62</td>
<td>27.87*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 776.6</td>
<td>57</td>
<td>13.62</td>
<td></td>
</tr>
<tr>
<td>Adjusted post test mean</td>
<td>161.55</td>
<td>162.19</td>
<td>154.35</td>
<td>B: 759.21</td>
<td>2</td>
<td>379.60</td>
<td>27.38*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 776.69</td>
<td>56</td>
<td>13.86</td>
<td></td>
</tr>
</tbody>
</table>

N=60   B: Between group variance   W: Within group variance
*S*Significant at 0.05 level
F ratio needed to be significant at 0.05 level: 3.15.
The analysis of data in table: 2 shows significant f-ratios, for both post and adjusted post test means. Which leads us to conclude that significant difference is existing among the post and adjusted post test means of serum LDL levels of the three groups.

To further analysis which experimental programme is better, pair wise mean analysis is done by using least significant difference test. The differences between the paired adjusted final means are shown in table: 3

**Table: 3**

**PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE EXPERIMENTAL GROUPS ON SERUM LDL LEVELS**

<table>
<thead>
<tr>
<th>Aerobic group</th>
<th>Yogic group</th>
<th>Aerobic-Yogic group</th>
<th>Difference between means</th>
<th>C.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>161.55</td>
<td>162.19</td>
<td></td>
<td>0.64</td>
<td>2.35</td>
</tr>
<tr>
<td>162.19</td>
<td>154.35</td>
<td></td>
<td>7.84*</td>
<td>2.35</td>
</tr>
<tr>
<td>161.55</td>
<td>154.35</td>
<td></td>
<td>7.2*</td>
<td>2.35</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level

Comparing the pair wise difference of means with critical difference in table: 3, it is evident that there is no significant
difference between means of Aerobic and Yogic groups. Whereas mean of Combined Aerobic-Yogic group is significantly lower than the other two groups. Thus, it is concluded that Combined Aerobic-Yogic programme is more effective than individual programmes of Yoga and Aerobic exercise and Aerobic exercise and yogic programme are almost equally effective in bringing down the serum LDL levels.

Table: 4

PAIRED $t$ - TEST ANALYSIS BETWEEN PRE AND POST TEST SERUM HDL LEVELS OF THE THREE EXPERIMENTAL GROUPS

<table>
<thead>
<tr>
<th>Experimental Groups</th>
<th>Pre mean values</th>
<th>Post mean values</th>
<th>Estimated common variance</th>
<th>Calculated 't' values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic group</td>
<td>29.75</td>
<td>50.9</td>
<td>6.61</td>
<td>14.31*</td>
</tr>
<tr>
<td>Yogic Group</td>
<td>28.79</td>
<td>50.1</td>
<td>3.09</td>
<td>30.60*</td>
</tr>
<tr>
<td>Aerobic Yogic Group</td>
<td>30.2</td>
<td>57.5</td>
<td>6.84</td>
<td>17.83*</td>
</tr>
</tbody>
</table>

Each group n=20

* Significant at 0.05 level.
For one tailed test $t_{0.05} (19) = 1.729$
Since all the calculated t-values in table: 4 are significant, we conclude that all the three experimental programmes are significantly effective in increasing serum HDL levels.

The pre and post test mean values of serum HDL levels of the three experimental groups are shown in figure: ii.
### Table: 5

**ANALYSIS OF VARIANCE AND COVARIANCE OF THREE EXPERIMENTAL GROUPS ON SERUM HDL LEVELS**

<table>
<thead>
<tr>
<th>Means</th>
<th>Aerobic group</th>
<th>Yogic group</th>
<th>Aerobic &amp; Yogic group</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean sum of square</th>
<th>f-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre test mean</td>
<td>29.75</td>
<td>28.79</td>
<td>30.2</td>
<td>B: 16.04</td>
<td>2</td>
<td>8.02</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 657.9</td>
<td>57</td>
<td>11.54</td>
<td></td>
</tr>
<tr>
<td>Post test mean</td>
<td>50.9</td>
<td>50.1</td>
<td>57.5</td>
<td>B: 659.74</td>
<td>2</td>
<td>329.87</td>
<td>18.91*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 994.6</td>
<td>57</td>
<td>17.44</td>
<td></td>
</tr>
<tr>
<td>Adjusted post test mean</td>
<td>50.86</td>
<td>49.94</td>
<td>57.38</td>
<td>B: 681.3</td>
<td>2</td>
<td>340.65</td>
<td>19.65*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 970.69</td>
<td>56</td>
<td>17.33</td>
<td></td>
</tr>
</tbody>
</table>

N=60  
B: Between group variance  
W: Within group variance

*Significant at 0.05 level  
F ratio needed for significance at 0.05 level: 3.15.

The analysis of data in table: 5 shows significant f-ratios, for both post and adjusted post test means. Which leads us to conclude that significant difference is existing among the post and adjusted post test means of serum HDL levels of the three groups.

To further analyse which experimental programme is better, pair wise mean analysis is done by using least significant difference test. The differences between the paired adjusted final means are shown in table: 6
Table: 6

PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE EXPERIMENTAL GROUPS OF SERUM HDL LEVELS

<table>
<thead>
<tr>
<th>Aerobic group</th>
<th>Yogic group</th>
<th>Aerobic-yogic group</th>
<th>Difference between means</th>
<th>c.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.86</td>
<td>49.94</td>
<td></td>
<td>0.92</td>
<td>2.63</td>
</tr>
<tr>
<td>49.94</td>
<td>57.38</td>
<td></td>
<td>7.44*</td>
<td>2.63</td>
</tr>
<tr>
<td>50.86</td>
<td>57.38</td>
<td></td>
<td>6.52*</td>
<td>2.63</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level

Comparing the pair wise difference of means with critical difference, it is evident that there is no significant difference between means of Aerobic and Yogic groups. Whereas mean of Combined Aerobic-Yogic group is significantly higher than the means of other two groups. Thus, it is concluded that Combined Aerobic-Yogic programme is more effective than individual programmes of Yoga and Aerobic exercise, and Aerobic exercise and yogic programme are equally effective in increasing the serum HDL levels.
**Hypertension**: The analysis of data pertaining to the systolic and diastolic blood pressures in mmHg of the three experimental groups is produced below:

**Table: 7**

**PAIRED t-TEST ANALYSIS BETWEEN PRE AND POST TEST SYSTOLIC BLOOD PRESSURE LEVELS OF THREE EXPERIMENTAL GROUPS.**

<table>
<thead>
<tr>
<th>Experimental Groups</th>
<th>Pre mean values</th>
<th>Post mean values</th>
<th>Estimated common variance</th>
<th>Calculated ‘t’ values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic group</td>
<td>170.1</td>
<td>149.55</td>
<td>6.48</td>
<td>14.18*</td>
</tr>
<tr>
<td>Yogic Group</td>
<td>171.11</td>
<td>136.4</td>
<td>7.13</td>
<td>21.74*</td>
</tr>
<tr>
<td>Aerobic Yogic Group</td>
<td>172.1</td>
<td>132.4</td>
<td>9.04</td>
<td>19.63*</td>
</tr>
</tbody>
</table>

Each group n=20

* Significant at 0.05 level.

For one tailed test t_{0.05 (19)}= 1.729

Since all the calculated t-values in table: 7 are significant, we conclude that all the three experimental programmes are significantly effective in decreasing systolic blood pressure levels.

The pre and post-test mean values of systolic blood pressure levels of the three experimental groups are shown in figure:iii.
**Table: 8**

**ANALYSIS OF VARIANCE AND COVARIANCE OF THREE EXPERIMENTAL GROUPS ON SYSTOLIC BLOOD PRESSURE**

<table>
<thead>
<tr>
<th>Means</th>
<th>Aerobic group</th>
<th>Yogic group</th>
<th>Aerobic &amp; Yogic group</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean sum of square</th>
<th>f-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre test mean</td>
<td>170.1</td>
<td>171.11</td>
<td>172.1</td>
<td>B: 40</td>
<td>2</td>
<td>20</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 2577.4</td>
<td>57</td>
<td>45.21</td>
<td></td>
</tr>
<tr>
<td>Post test mean</td>
<td>149.55</td>
<td>136.4</td>
<td>132.4</td>
<td>B: 3220.3</td>
<td>2</td>
<td>1610.15</td>
<td>71.11*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 1290.55</td>
<td>57</td>
<td>22.64</td>
<td></td>
</tr>
<tr>
<td>Adjusted post test mean</td>
<td>149.65</td>
<td>136.39</td>
<td>132.3</td>
<td>B: 3247.35</td>
<td>2</td>
<td>1623.67</td>
<td>72.09*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 1261.63</td>
<td>56</td>
<td>22.52</td>
<td></td>
</tr>
</tbody>
</table>

N=60      B: Between group variance  W: Within group variance
*Significant at 0.05 level
F ratio needed for significance at 0.05 level: 3.15
The analysis of data in table 8 shows significant f-ratios, for both post and adjusted post test means. Which leads us to conclude that significant difference is existing among the post and adjusted post test means of systolic blood pressure levels of the three groups.

To further analyse which experimental programme is better, pair wise mean analysis is done by using least significant difference test. The differences between the paired adjusted final means are shown in table 9

Table 9

PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE EXPERIMENTAL GROUPS OF SYSTOLIC BLOOD PRESSURE

<table>
<thead>
<tr>
<th></th>
<th>Yogic group</th>
<th>Aerobic-Yogic group</th>
<th>Difference between means</th>
<th>c.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic</td>
<td>149.65</td>
<td>136.39</td>
<td>13.26*</td>
<td>3.0</td>
</tr>
<tr>
<td>group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yogic</td>
<td>136.39</td>
<td>132.3</td>
<td>4.09*</td>
<td>3.0</td>
</tr>
<tr>
<td>group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aerobic</td>
<td>149.65</td>
<td>132.3</td>
<td>17.35*</td>
<td>3.0</td>
</tr>
<tr>
<td>group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level.
Comparing the pairwise difference of means with critical difference, it is evident that Combined Aerobic-Yogic group mean is significantly lower than means of Yogic and Aerobic groups. Whereas mean of Aerobic group is significantly higher than the means of other two groups. Thus, it is concluded that Combined Aerobic-Yogic programme is more effective than individual programmes of Yoga and Aerobic exercise. However, Aerobic exercise programme is least effective of the three experimental programmes in bringing down systolic blood pressure towards normal values.

Table: 10

**PAIRED t - TEST ANALYSIS BETWEEN PRE AND POST TEST DIASTOLIC BLOOD PRESSURE LEVELS OF THREE EXPERIMENTAL GROUPS**

<table>
<thead>
<tr>
<th>Experimental Groups</th>
<th>Pre mean values</th>
<th>Post mean values</th>
<th>Estimated common variance</th>
<th>Calculated 't' values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic group</td>
<td>97.5</td>
<td>94.25</td>
<td>2.15</td>
<td>7.69*</td>
</tr>
<tr>
<td>Yogic Group</td>
<td>98.7</td>
<td>88.8</td>
<td>3.69</td>
<td>11.97*</td>
</tr>
<tr>
<td>Aerobic Yogic Group</td>
<td>99.2</td>
<td>87.05</td>
<td>3.18</td>
<td>17.08*</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level.
For one tailed test $t_{0.05} (19) = 1.729$
Since all the calculated t-values in table: 10 are significant, we conclude that all the three experimental programmes are significantly effective in decreasing diastolic blood pressure levels.

The pre and post test mean values of diastolic blood pressures of the three experimental groups are shown in figure: iv.
**Table: 11**

**ANALYSIS OF VARIANCE AND COVARIANCE OF THREE EXPERIMENTAL GROUPS ON DIASTOLIC BLOOD PRESSURE**

<table>
<thead>
<tr>
<th>Means</th>
<th>Aerobic group</th>
<th>Yogic group</th>
<th>Aerobic-Yogic group</th>
<th>Sum of squares</th>
<th>Df</th>
<th>Mean sum of square</th>
<th>f-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre test mean</td>
<td>97.95</td>
<td>98.7</td>
<td>99.2</td>
<td>B: 15.83</td>
<td>2</td>
<td>7.91</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 558.35</td>
<td>57</td>
<td>9.79</td>
<td></td>
</tr>
<tr>
<td>Post test mean</td>
<td>94.25</td>
<td>88.80</td>
<td>87.05</td>
<td>B: 564.04</td>
<td>2</td>
<td>282.02</td>
<td>37.40*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 429.9</td>
<td>57</td>
<td>7.54</td>
<td></td>
</tr>
<tr>
<td>Adjusted post test mean</td>
<td>94.91</td>
<td>88.76</td>
<td>86.81</td>
<td>B: 624.01</td>
<td>2</td>
<td>312</td>
<td>51.40*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 340.15</td>
<td>56</td>
<td>6.07</td>
<td></td>
</tr>
</tbody>
</table>

N=60  
B: Between group variance  
W: Within group variance

*Significant at 0.05 level

F ratio needed for significance at 0.05 level: 3.15.

The analysis of data in table: 11 shows, significant f -ratios, for both post and adjusted post test means. Which leads us to conclude that significant difference is existing among the post and adjusted post test means of diastolic blood pressure levels of the three groups.

To further analyse which experimental programme is better, pair wise mean analysis is done by using least significant difference
test. The differences between the paired adjusted final means have been shown in table: 12

Table: 12

PAIR ED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE EXPERIMENTAL GROUPS OF DIASTOLIC BLOOD PRESSURE

<table>
<thead>
<tr>
<th></th>
<th>Yogic group</th>
<th>Aerobic-Yogic group</th>
<th>Difference between means</th>
<th>c.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic</td>
<td>94.91</td>
<td>88.76</td>
<td>6.15*</td>
<td>1.55</td>
</tr>
<tr>
<td>group</td>
<td></td>
<td>86.81</td>
<td>1.95*</td>
<td>1.55</td>
</tr>
<tr>
<td></td>
<td>94.91</td>
<td>86.81</td>
<td>8.10*</td>
<td>1.55</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level

Comparing the pair wise difference of means with critical difference, it is evident that combined Aerobic-Yogic group mean is significantly lower than means of Yogic and Aerobic groups. Whereas mean of Aerobic group is significantly higher than the means of other two groups. Thus, it is concluded that Combined Aerobic-Yogic programme is more effective than individual programmes of Yoga and Aerobic exercise and Aerobic exercise programme is least effective of the three experimental programmes in bringing down diastolic blood pressure levels towards normal values.
Diabetes:

The prominent risk factors associated with diabetes are enhanced blood glucose levels. The analyses of data pertaining to fasting blood glucose levels in mg% is produced below:

Table: 13

PAIRED t - TEST ANALYSIS BETWEEN PRE AND POST TEST FASTING BLOOD GLUCOSE LEVELS OF THREE EXPERIMENTAL GROUPS

<table>
<thead>
<tr>
<th>Experimental Groups</th>
<th>Pre mean values</th>
<th>Post mean values</th>
<th>Estimated common variance</th>
<th>Calculated 't' values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic group</td>
<td>169.0</td>
<td>139.40</td>
<td>6.76</td>
<td>19.53*</td>
</tr>
<tr>
<td>Yogic Group</td>
<td>170.5</td>
<td>119.05</td>
<td>6.70</td>
<td>34.34*</td>
</tr>
<tr>
<td>Aerobic Yogic Group</td>
<td>168.4</td>
<td>114.50</td>
<td>9.19</td>
<td>26.21*</td>
</tr>
</tbody>
</table>

Each group n=20

* Significant at 0.05 level.

For one tailed test t.05 (19) = 1.729
Since all the calculated t-values in table 13 are significant, we conclude that all the three experimental programmes are significantly effective in decreasing Fasting blood Glucose levels.

The pre and post test mean values of Fasting Blood Glucose levels of the three experimental groups are shown in figure: v
### Table: 14

#### ANALYSIS OF VARIANCE AND COVARIANCE OF THREE EXPERIMENTAL GROUPS ON FASTING BLOOD GLUCOSE LEVELS

<table>
<thead>
<tr>
<th>Means</th>
<th>Aerobic group</th>
<th>Yogic group</th>
<th>Aerobic-Yogic group</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean sum of square</th>
<th>f-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre test mean</td>
<td>169</td>
<td>170.5</td>
<td>168.4</td>
<td>B: 46.8</td>
<td>2</td>
<td>23.4</td>
<td>0.79</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 1675.8</td>
<td>57</td>
<td>29.40</td>
<td></td>
</tr>
<tr>
<td>Post test mean</td>
<td>139.4</td>
<td>119.05</td>
<td>114.5</td>
<td>B: 7032.34</td>
<td>2</td>
<td>3516.17</td>
<td>102.87*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 1948.75</td>
<td>57</td>
<td>34.18</td>
<td></td>
</tr>
<tr>
<td>Adjusted post test mean</td>
<td>139.38</td>
<td>119.12</td>
<td>114.55</td>
<td>B: 7026.12</td>
<td>2</td>
<td>3513.06</td>
<td>101.38*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 1940.78</td>
<td>56</td>
<td>34.65</td>
<td></td>
</tr>
</tbody>
</table>

N=60

B: Between group variance  
W: Within group variance

*Significant at 0.05 level

F ratio needed for significance at 0.05 level: 3.15.

The analysis of data in table: 14 shows, significant f -ratios, for both post and adjusted post test means. Which leads us to conclude that significant difference is existing among the post and adjusted post test means of fasting blood glucose levels of the three groups.

To further analyse, which experimental programme is better, pair wise mean analysis is done by using least significant difference
test. The differences between the paired adjusted final means have been shown in table: 15

Table: 15

PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE EXPERIMENTAL GROUPS OF FASTING BLOOD GLUCOSE LEVELS

<table>
<thead>
<tr>
<th>Aerobic group</th>
<th>Yogic group</th>
<th>Aerobic-Yogic group</th>
<th>Difference between means</th>
<th>c.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>139.38</td>
<td>119.12</td>
<td>114.55</td>
<td>20.26*</td>
<td>3.72</td>
</tr>
<tr>
<td>119.12</td>
<td>114.55</td>
<td>3.72</td>
<td>4.57*</td>
<td>3.72</td>
</tr>
<tr>
<td>139.38</td>
<td>114.55</td>
<td>3.72</td>
<td>24.83*</td>
<td>3.72</td>
</tr>
</tbody>
</table>

*Significant at 0.05 level.

Comparing the pair wise difference of means with critical difference, it is evident that combined Aerobic-Yogic group mean is significantly lower than means of Yogic and Aerobic groups. Whereas mean of Aerobic group is significantly higher than the means of other two groups. Thus, it is concluded that Combined Aerobic-Yogic programme is more effective than individual programmes of Yoga and Aerobic exercise, and Aerobic exercise programme is least effective of the three experimental programmes in bringing down fasting blood glucose levels towards normal values.
Peptic Ulcer:

In order to objectively evaluate, the clinical (for 36 subjects) and endoscopic (for 24 subjects) findings of peptic ulcer were rated from 0 – 2 and 0-6 respectively. The analysis of data pertaining to these ratings of the three experimental programmes is produced below:

Table: 16

PAIRED t – TEST ANALYSIS BETWEEN PRE AND POST TEST PEPTIC ULCER (CLINICAL RATINGS) OF THREE EXPERIMENTAL GROUPS

<table>
<thead>
<tr>
<th>Experimental Groups</th>
<th>Pre mean values</th>
<th>Post mean values</th>
<th>Estimated common variance</th>
<th>Calculated ‘t’ values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic group</td>
<td>11.25</td>
<td>10.58</td>
<td>1.43</td>
<td>1.62</td>
</tr>
<tr>
<td>Yogic Group</td>
<td>12.66</td>
<td>6.91</td>
<td>1.05</td>
<td>18.97*</td>
</tr>
<tr>
<td>Aerobic Yogic Group</td>
<td>13.25</td>
<td>7.08</td>
<td>1.43</td>
<td>14.94*</td>
</tr>
</tbody>
</table>

* Significant at 0.05 level.

Each group n=12

For one tailed test $t_{0.05} (11) = 1.796$
Since table: 16 shows that calculated t-value is insignificant for pre and post test means of Aerobic group. We conclude that Aerobic programme is not effective on peptic ulcer. Where as the other two groups’ calculated t-values are significant, which leads us to conclude that Yoga and Combined Aerobic-Yogic programmes are significantly effective in reducing the clinical ratings (intensity) of peptic ulcer.

The pre and post test mean values of clinical ratings of the three experimental groups are shown in figure: vi
**Table: 17**

ANALYSIS OF VARIANCE AND COVARIANCE OF THREE EXPERIMENTAL GROUPS ON PEPTIC ULCER (CLINICAL RATINGS)

<table>
<thead>
<tr>
<th>Means</th>
<th>Aerobic group</th>
<th>Yogic group</th>
<th>Aerobic-Yogic group</th>
<th>Sum of squares</th>
<th>Df</th>
<th>Mean sum of square</th>
<th>f-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre test mean</td>
<td>11.25</td>
<td>12.66</td>
<td>13.25</td>
<td>B: 25.39</td>
<td>2</td>
<td>12.69</td>
<td>2.93</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 143.17</td>
<td>33</td>
<td>4.33</td>
<td></td>
</tr>
<tr>
<td>Post test mean</td>
<td>10.58</td>
<td>6.91</td>
<td>7.08</td>
<td>B: 102.89</td>
<td>2</td>
<td>51.44</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 84.75</td>
<td>33</td>
<td>2.56</td>
<td>20.09*</td>
</tr>
<tr>
<td>Adjusted post test mean</td>
<td>11.16</td>
<td>6.76</td>
<td>6.62</td>
<td>B: 138.46</td>
<td>2</td>
<td>69.23</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 44.76</td>
<td>32</td>
<td>1.39</td>
<td>49.80*</td>
</tr>
</tbody>
</table>

N= 36  B: Between group variance  W: Within group variance

*Significant at 0.05 level  
F ratio needed for significance at 0.05 level: 3.32.

The analysis of data in table: 17 shows significant f-ratios, for both post and adjusted post test means. Which leads us to conclude that significant difference is existing among the post and adjusted post test means of clinical ratings of the three groups.

To further analyse which experimental programme is better, pair wise mean analysis is done by using least significant difference test. The differences between the paired adjusted final means have been shown in table: 18
Table: 18

PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE BETWEEN MEANS OF THREE EXPERIMENTAL GROUPS OF PEPTIC ULCER (CLINICAL RATINGS)

<table>
<thead>
<tr>
<th>Aerobic group</th>
<th>Yogic group</th>
<th>Aerobic-Yogic group</th>
<th>Difference between means</th>
<th>C.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.16</td>
<td>6.76</td>
<td>11.16</td>
<td>6.76</td>
<td></td>
</tr>
<tr>
<td>11.16</td>
<td>6.62</td>
<td>6.62</td>
<td>6.62</td>
<td></td>
</tr>
<tr>
<td>11.16</td>
<td>6.62</td>
<td>6.62</td>
<td>6.62</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level.

Comparing the pairwise difference of means with critical difference, it is evident that there is no significant difference between the means of Combined Aerobic-Yogic group and Yogic group. Whereas mean of Aerobic group is significantly higher than the means of other two groups. Thus, it is concluded that Combined Aerobic-Yogic programme and Yogic programme are equally effective in medicating peptic ulcer. Whereas Aerobic programme is least effective on clinical ratings of peptic ulcer.
Table: 19

PAIRED t – TEST ANALYSIS BETWEEN PRE AND POST TEST
PEPTIC ULCER (ENDOSCOPIC RATINGS) OF THREE
EXPERIMENTAL GROUPS

<table>
<thead>
<tr>
<th>Experimental Groups</th>
<th>Pre mean values</th>
<th>Post mean values</th>
<th>Estimated common variance</th>
<th>Calculated 't' values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic group</td>
<td>13.25</td>
<td>12.87</td>
<td>1.68</td>
<td>0.63</td>
</tr>
<tr>
<td>Yogic Group</td>
<td>14.12</td>
<td>7.75</td>
<td>1.09</td>
<td>16.52*</td>
</tr>
<tr>
<td>Aerobic Yogic Group</td>
<td>12.12</td>
<td>7.37</td>
<td>0.707</td>
<td>19.0*</td>
</tr>
</tbody>
</table>

Each group n=8

* Significant at 0.05 level.

For one tailed test t_{.05} (7) = 1.895

Since table: 19 shows that calculated t-value is insignificant for pre and post test means of aerobic group. We conclude that Aerobic programme is not effective on endoscopic ratings of peptic ulcer. Where as the other two groups' calculated t- values are significant, which leads us to conclude that Yoga and Combined Aerobic-Yogic
programmes are significantly effective in reducing the endoscopic ratings (intensity) of peptic ulcer.

The pre and post mean values of endoscopic ratings of the three experimental groups are shown in figure: vii.
Table: 20

ANALYSIS OF VARIANCE AND COVARIANCE OF THREE EXPERIMENTAL GROUPS ON PEPTIC ULCER (ENDOSCOPIC RATINGS)

<table>
<thead>
<tr>
<th>Means</th>
<th>Aerobic group</th>
<th>Yogic group</th>
<th>Aerobic-Yogic group</th>
<th>Sum of squares</th>
<th>Df</th>
<th>Mean sum of square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre test mean</td>
<td>13.25</td>
<td>14.12</td>
<td>12.12</td>
<td>B: 16.15</td>
<td>2</td>
<td>8.07</td>
<td>4.11*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 41.25</td>
<td>21</td>
<td>1.96</td>
<td></td>
</tr>
<tr>
<td>Post test mean</td>
<td>12.87</td>
<td>7.75</td>
<td>7.37</td>
<td>B: 151.09</td>
<td>2</td>
<td>75.54</td>
<td>60.43*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>W: 26.25</td>
<td>21</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>Adjusted post</td>
<td>12.83</td>
<td>7.33</td>
<td>7.81</td>
<td>B: 148.44</td>
<td>2</td>
<td>74.22</td>
<td>81.56*</td>
</tr>
<tr>
<td>test mean</td>
<td></td>
<td></td>
<td></td>
<td>W: 18.29</td>
<td>20</td>
<td>0.91</td>
<td></td>
</tr>
</tbody>
</table>

N= 24  B: Between group variance  W: Within group variance

*Significant at 0.05 level
F ratio needed for significance at 0.05 level: 3.49.

The analysis of data in table: 20 shows significant f -ratios, which leads us to conclude that significant difference is existing among the pre, post and adjusted post test means of peptic ulcer's endoscopic ratings of the three groups.

To further analyse which experimental programme is better, pair wise mean analysis is done by using least significant difference
test. The differences between the paired adjusted final means have been shown in table: 21.

Table: 21

<table>
<thead>
<tr>
<th></th>
<th>Aerobic group</th>
<th>Yogic group</th>
<th>Aerobic-Yogic group</th>
<th>Difference between means</th>
<th>C.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.83</td>
<td>7.33</td>
<td>7.81</td>
<td>5.5*</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td>7.33</td>
<td>7.81</td>
<td>0.48</td>
<td></td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td>12.83</td>
<td>7.81</td>
<td>5.02*</td>
<td></td>
<td>0.96</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level.

Comparing the pair wise difference of means with critical difference, it is evident that there is no significant difference between means of Combined Aerobic-Yogic group and Yogic group. Whereas mean of Aerobic group is significantly higher than the means of other two groups. Thus, it is concluded that Combined Aerobic-Yogic programme and Yogic programme are equally effective in medicating peptic ulcer. Whereas Aerobic programme is least effective on endoscopic ratings of peptic ulcer.

**Insomnia:** Hearing and noting the half-hourly bell counts of wall
clock during sleep from 10 p.m. to 6 a.m. was the decided measure of 
insomnia in this study. The analysis of data pertaining to this 
measure is produced below:

Table: 22

PAIRED t – TEST ANALYSIS BETWEEN PRE AND POST TEST 
HALF-HOURLY BELL COUNTS OF THE THREE 
EXPERIMENTAL GROUPS (INSOMNIA)

<table>
<thead>
<tr>
<th>Experimental Groups</th>
<th>Pre mean values</th>
<th>Post mean values</th>
<th>Estimated common variance</th>
<th>Calculated ‘t’ values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic group</td>
<td>10.8</td>
<td>7.0</td>
<td>1.44</td>
<td>11.72*</td>
</tr>
<tr>
<td>Yogic Group</td>
<td>11.05</td>
<td>2.95</td>
<td>1.61</td>
<td>22.37*</td>
</tr>
<tr>
<td>Aerobic Yogic Group</td>
<td>11.4</td>
<td>2.63</td>
<td>1.50</td>
<td>26.11*</td>
</tr>
</tbody>
</table>

Each group n=20

*Significant at 0.05 level.

For one tailed test t.05 (19)= 1.729

Since all the calculated t-values in table: 22 are significant, we 
conclude that all the three experimental programmes are significantly
effective in decreasing, hearing and noting of half-hourly bell counts of wall clock from 10 p.m. to 6 a.m.

The pre and post test mean values of half-hourly bell counts of wall clock from 10 p.m. to 6 a.m. of the three experimental groups are shown in figure: viii
The analysis of data in Table: 23 shows significant f-ratios, for both post and adjusted post test means. Which leads us to conclude that significant difference is existing among the post and adjusted post means of wall clock bell counts of the three groups.

To further analyse, which experimental programme is better, pair wise mean analysis is done by using least significant difference test. The differences between the paired adjusted final means have been shown in Table: 24.
Table: 24

PAIRED ADJUSTED FINAL MEANS AND DIFFERENCE
BETWEEN MEANS OF THREE EXPERIMENTAL GROUPS OF
INSOMNIA

<table>
<thead>
<tr>
<th>Aerobic group</th>
<th>Yogic group</th>
<th>Aerobic-Yogic group</th>
<th>Difference between means</th>
<th>C.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.97</td>
<td>2.95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.95</td>
<td>2.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.97</td>
<td>2.63</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at 0.05 level

Comparing the pair wise difference of means with critical
difference, it is evident that Combined Aerobic-Yogic group mean is
almost equal to that of the Yogic group mean. Where as mean of
Aerobic group is significantly higher than the means of other two
groups. Thus, it is concluded that Combined Aerobic-Yogic
programme and yogic programme are equally effective on Insomnia
Aerobic exercise programme is least effective of the three
experimental programmes in decreasing the hearing and noting of
wall clock bell counts from 10 a.m to 6 p.m
Discussion of findings

Results obtained from the analysis of data shows that almost all the three programmes are effective in medicating psychosomatic disorders undertaken in the study.

Further post hoc analysis of the results had revealed that in most of the cases the Combined Aerobic-Yogic programme is more effective than individual programmes of Yoga and Aerobic exercise. However, it is also observed that in most of the cases Yogic programme is more effective than Aerobic exercise programme in medicating significantly the various psychosomatic disorders.

The discussion of our findings in light of observation made by other researchers in similar studies is produced below:

**CHD:** As the risk factors associated with CHD are, increased levels of LDL and decreased levels of HDL. The discussion in relation to these variables is presented.

**LDL:** The findings of the study clearly indicated that serum LDL levels are significantly reduced in all the three groups towards normal values. However, the decrease is more profound in Combined Aerobic-Yogic programme than other two groups. However the
Aerobic and Yogic programmes are almost equal in bringing down LDL levels.

The serum HDL levels are significantly increased in all the three groups, however the increase is more in Combined Aerobic-Yogic group than individual Yogic and Aerobic groups.

The individual programmes of Yoga and Aerobic exercise are almost equal in increasing the serum HDL level.

In relation to yoga the findings of our study are supported by the findings of Mahajan A.S. and Reddy K.S. (1994), in which yogic life style was significantly effective in decreasing all lipid parameters except HDL levels.

In relation to exercise, our finding are in the line with MC Common MR and Israel RG (1994), who had reported a significant reduction in triglyceride and total cholesterol minus HDL and increase in HDL levels after a 14 weeks of exercise programme of 30-45 min/day.

Jennings, G.L., in (1995), observed that changes in blood pressure and lipid profiles vary to the level and duration of increased physical activity.
Wood P.D. et.al (1979), in his study concluded that chronic exercise training causes, decrease in total blood cholesterol, triglycerides and low density lipoprotein (LDL) concentrations and an increase in HDL concentration in both men and women.

Karambelkar P.V. et.al (1977) observed significant reduction of mean cholesterol in 22 males and no significant reduction in 10 females at the end of three weeks yogic physical culture.

Along with our study many other researchers has shown that yoga and exercise, not only lowers total blood cholesterol but also increases that factor of cholesterol known as HDL, which is protective against CHD. As it do not adhere to, or collect on inner walls of the coronary arteries, but it also helps in breaking down the fatty deposits already present, composed of LDL and VLDL that cause obstruction in the coronary circulation. As this obstruction is cleared by the reduced levels of LDL and also HDL's breaking action on LDL's fatty deposits in the coronary arteries, a free coronary blood circulation is possible to all parts of the heart and thus chances of CHD are decrease to minimum.

**Hypertension:** is a disorder caused due to enhanced blood pressure levels both systolic and diastolic. The findings of our study clearly
indicated that all the three experimental programmes are significantly effective in reducing both the systolic as well as the diastolic blood pressures towards normal values.

However, Combined Aerobic-Yogic programme is most effective in bringing down both systolic as well as diastolic blood pressures towards the normal values of 120-80 mmHg. Also individual programme of Yoga is more effective than individual programme of Aerobic exercise in bringing down both systolic and diastolic blood pressures, towards normal values.

With reference to yoga, the findings of our study are in line with the findings of K.S. Joshi (1978) whereby the systolic blood pressure and pulse rate was significantly reduced towards normal values after half an hour prandharna session for seven consecutive days.

In relation to yoga, the findings of our study are also supported by the findings of Murugesan R. et.al's (2000) study, in which they observed, that one hour session of morning and evening yogic programme of 11 weeks on 33 hypertensives aged, 35 to 65 years was effective in controlling significantly, the measures of hypertension.
In relation to yoga the findings of our study are also supported by Patel, C. et.al (1975) Who observed that six weeks of yogic programme was more effective than six weeks of biofeedback programme on 34 hypertensive patients.

In relation to a technique of our yogic programme called transcendental meditation, Blackwell, B. et.al (1976) conducted a study to determine the effect of T.M. on hypertension. They observed that after 12 weeks of T.M. six subjects showed significant reduction in their anxiety scores and six subjects showed significant reduction in home and four in clinical levels of blood pressure.

In relation to exercise the findings of our study are supported by Choquette, G. et.al (1973) through their study in which they observed that 6 month of exercise programme on borderline hypertensive patients was significantly effective in reducing their responses related to hypertension.

In a recent review of the literature concerning the effects of exercise on blood pressure, the following conclusions were noted. (Clarke H.H. ed. 1979).
1. In epidemiological surveys, men in physically active occupations had lowered systolic and diastolic blood pressure than did those in sedentary work.

2. Men identified as physically fit by a bicycle ergometer test had lower systolic and diastolic blood pressures than did those, identified as unfit.

3. Two studies showed decrease (one did not) in both blood pressures from participation in exercise regimens of the walk-jog type. In one of these studies, the subjects had multiple coronary heart attack risk factors, including high blood pressure.

4. In one study hypertensive men, lowered their blood pressures following participation in isometric exercise over a period of 5 to 8 weeks.

5. Two studies reported improved blood pressure of post coronary patients with elevated blood pressures as a result of aerobic type training over a period of 3 to 8 months; matched control groups did not improve.

6. As might be expected, the effects of exercise on systolic and diastolic blood pressures of hypertensive individuals are
greater than for those with blood pressures within the normal range.

Tipton, C.M. et.al. (1977) concluded that the physiological advantages from lowering blood pressure through exercise in hypertensive populations are sufficient to encourage the inclusion of exercise within most therapeutic programmes designed to manage this disease.

The main reason of increased blood pressure is decreased size of blood vessels and increased fatty deposits on inner walls of arteries. Exercise and yogic activities are associated with the slowdown of aging process, decreased LDL levels and increased HDL levels which helps in breaking up of fatty acids deposits of inner walls of arteries. This results in restoring normal cross sectional vessel size and its elasticity. All these factors helps in restoring normal blood pressure levels.

**Diabetes Mellitus:**

Results of the study shows that fasting blood glucose is significantly reduced towards normal values of all the three groups after the administration of the three experimental programmes. However, Combined Aerobic-Yogic programme is most effective in
bringing blood sugar level towards normal values than individual programmes of Yoga and Aerobic exercise. However, Yogic programme is more effective than individual programme of Aerobic exercise in bringing down blood sugar levels.

This signifies that all the programmes are effective in varied proportion in bringing down blood sugar towards normal levels. However, Combined Aerobic-Yogic programme is most effective in overhauling or enhancing the functional capacities of pancreas in relation to optimal insulin production. The individual programmes of Yoga and Aerobic exercise had also effected pancreatic functions, but it is seen that when Aerobic exercise and Yoga are done in combination, a more intense effect is achieved on blood sugar levels.

In relation to yoga, the findings of our study are consistent with the findings of study conducted by Jain S.C. et.al (1993), in which the changes in blood glucose and glucose tolerance (OGTT) after 40 days of yogic therapy, in 149 non insulin dependent diabetes NIDDM were, significant reduction in hyperglycemia and Area index total with decrease oral hypoglycemia, and Area index total with oral hypoglycemia drugs requirement for maintenance of normoglycemia.
With reference to exercise, Wannamethee, S.G. et.al (2000), observed that increase levels of physical activity decreases the risk of type 2 diabetes (insulin dependent) in average follow up period of 16.8 years on 196 type 2 diabetics.

Rich Edward W. et.al (1999) observed in a 8 year follow up on 1419 incident of type 2 diabetes that substantial reduction in risk is associated with a greater participation in moderate to intense physical activity.

In relation to yoga, the findings of our study are also in line with the findings of Desai B.P. (1983), where he observed that serum lipase activity of diabetes patients was significantly reduced at the end of yogic treatment of seven weeks.

Thus yoga and exercise are held very effective in bringing down sugar levels towards normal, by creating a direct effect on the functioning aspects of pancreas.

**Peptic ulcer:**

Peptic ulcer results obtained from the pre and post analysis of clinical and endoscopic ratings clearly shows that Yoga and Combined Aerobic-Yogic programmes are equally effective in medicating peptic ulcer. However, the mean differences of pre and post test peptic
ulcer's both clinical and endoscopic ratings for Aerobic groups is not significant, which shows that Aerobic exercise was unable to create a significant effect on peptic ulcer.

In relation to exercise the findings of our study are half way in line with the findings of Cheng. Y. et al.'s (2000) study on the effect of physical active life style on deudenal and gastric ulcers. Whereby, they observed that physically active men had reduced chances of deudenal ulcers, but gastric ulcers for man and either type of ulcers for women were having no association with physical activity.

However in relation to yoga our findings are supported by T. Dale, (1979), through their study in which they observed that 6 months of transcendental mediation was very effective in reducing the intensity of peptic ulcer.

Desai B.P. and Bhole M.V. (1982) also observed in their study that gastric acidity was significantly reduced in hyper-acidic patients after a six weeks of yogic treatment programme.

Thus yoga is very effective in curing peptic ulcer as through it, the psycho-physiological gastrointestinal reactions, which are resulting in increased gastric acid productions, are altered and harmonised resulting in decreased acid production to optimal levels.
As Asif Golwala F. (1997) had pointed out that peptic ulcer develops only in those areas, which comes in direct contact with acid namely stomach, deudonum and lower ends of oesophagus.

**Insomnia:**

The findings of our study clearly show that all the three programmes were effective in medicating insomnia. The post hoc analysis of data revealed that Aerobic programme is less effective than Yogic and Combined Aerobic-Yogic programmes. The Yogic and CAY programmes are almost equally effective in medicating insomnia.

The findings of our study are supported by the study of Muller Popkes and Hajak (1996), whereby, it was observed that progressive relaxation technique on 25 patients was significantly effective in improving their total sleep time, sleep efficiency and wake up after sleep onset.

The findings of our study are also supported by K.S. Joshi (1978) who reported that half hour session of prandharana for seven consecutive days was significantly effective in improving the sleeping hours of 18 patients.
The study of Bera, Gore and O.A.K. (1998), are also supporting our study to some extent. Whereby, they observed that Shavasana a yogic relaxation posture was more effective in recovery from induced physiological stress on 21 males and 6 females than two other postures (resting in chair and resting supine posture).

Yoga and exercise are helpful in controlling psycho-physiological reactions which results in a harmonious equilibrium among over all functions. Yogic and Aerobic programmes are helpful in removing anxiety and stress from the individual's mind, he becomes calm and peaceful. Exercise helps in improving organic functions leading to smooth psycho-physiological reaction pathways, which results in improved sleep time, poise, and mental health which facilitates a harmonious body mind relationship through proper coordination, balance and neuro-muscular control.

The mind is a bundle of sensations (root potentials tendencies i.e. ideas, habits, impulses and emotions) when things and interaction with external environment is not in the way expected by the individual than disturbances in these root potential tendencies takes place. Which leads to stress, anxiety and tension. Through nerves this tension is transferred to muscles, creating decreased joints flexibility, improper breathing, decreased circulation of blood, pain,
and irritability leading to hyperactivity of organs, resulting in the misalignment, maladjustment and malfunctioning in the various interrelated somatic components of the body. The homeostasis of the body is disturbed which is manifested through various somatic disorders.

Yoga has laid down psychosomatic means through various psycho-physiological processes, for dealing with body mind complexes. The psychosomatic practice of yoga brings a state of neuromuscular relaxation and increased energy restoration. Yogic process emphasis on the growth, development and purification of the nervous system (Nadi shodhan). This effects not only the various internal organs physically, but also tends towards mental peace, facilitating a harmonious body mind relationship.

In Pranayam a harmonious and rhythmic breath flow brings mental equilibrium and peace resulting in the dissolution of anxieties, tensions and increased power of mental concentration. Asanas are attitude bound to achieve a union of the body and mind. They correct and modify the internal homeostasis to perfect state of normalcy. The nerve centers are recuperated and regalvanised and the scattered forces of the body are gathered.
According to yoga, as the mind becomes calm and steady the clarity improves and individual becomes more aware of the forces, which brings about disturbances. He becomes mentally better equipped to deal with any situation with a tranquil mind. He remains unperturbed in difficult situation. Yoga therefore, re-educate the individual, in altering his habitual reaction pattern, develops a coping mechanism and thus holds the key to better living. Through various psycho-physiological processes it harmonises and integrates human personality at all levels and stages of life. This results in the obliteration of various psychosomatic disorders as whole.

The mechanism by which physical activity may reduce the occurrence or severity of CHD and other psychosomatic disorders of the study are increase in (1) Coronary collateral vascularization (2) Vessel size (3) HDL levels (4) Myocardial efficiency (5) Efficiency of peripheral blood distribution and return (6) Electron transport (7) Fibrinolytic capability (8) Red blood cell mass and blood volume (9) Thyroid function (10) Growth hormone production (11) Tolerance to stress (12) Prudent living habits joie de vivre (Joy of living).

Along with decrease in (1) Serum lipid levels (2) Triglycerides (3) Total cholesterol including LDL and excluding HDL (4) Glucose
intolerance (5) Obesity-adiposity (6) Platelet stickness (7) Arterial blood pressure (8) Heart rate (9) Vulnerability to dysrhythmias (10) Neurohormonal over reaction (11) Strain associated with psychic 'Stress'.

In the end it is concluded that though yoga and aerobic exercise are very effective on the psychosomatic disorders of our study. But their effects is more intense when they are done in combination. The findings of our study in most of the cased are supporting our hypothesis.
Chapter 5
Summary, Conclusions & Recommendations
SUMMARY

This study is an attempt to assess the effectiveness of yoga and aerobic activity in controlling the psychosomatic disorders.

The psychosomatic disorders undertaken in the study were C.H.D., Hypertension, Diabetes, Peptic ulcer and Insomnia.

For the purpose of this study 60 patients of each psychosomatic disorders were selected and divided into three, almost equated subgroups of 20 each on the basis of pre-experimental measures of the various psychosomatic disorders under taken in this study.

The three subgroups were subjected to the three experimental programmes of Aerobic exercise, Yoga and Combined Aerobic-Yogic exercise for a period of six months.

There after post-test was conducted of the chosen variables of various psychosomatic disorders and the data was collected in the form of following criterion measures of the study. LDL levels in mg %, HDL levels in mg %, systolic and diastolic blood pressure in mmHg, fasting blood glucose levels in mg %, clinical and endoscopic ratings of peptic ulcers, and half hourly counts of wall clock bell during sleep from 10 p.m. to 6 a.m.
Paired t-test was used to assess the significance of differences between the pre and post-test means of the chosen measures of various psychosomatic disorders. Further F test was used to test the significance of differences among the pre and post-test means of three groups, where F test was significant, LSD test was applied to assess that which of the groups means difference were most significant.

Results obtained from the analysis of data shows that in most of the cases the three programmes were effective in medicating psychosomatic disorders undertaken in this study, however only, Aerobic programme was unable to create a significant effect on the clinical and endoscopic ratings of peptic ulcer.

F ratios were also significant among the post and adjusted post means of the three experimental groups for all the chosen measures of psychosomatic disorder under taken in this study.

Further LSD analysis of the results showed that in most of the cases Combined Aerobic-Yogic programme was more effective than individual programmes of the Yoga and Aerobic exercise. Also Yogic programme in most of the cases was more effective than Aerobic
exercise programme in medicating significantly the psychosomatic disorders.

For each of the chosen measures the LSD analysis goes as –

**CHD:** The pre disposing risk factors associated with CHD are increased serum LDL levels and decreased serum HDL levels

**LDL:** The findings of the study clearly indicated that serum LDL levels were significantly reduced in all the three groups towards normal values of 130 to 170 mg %. However, the decrease was more profound in Combined Aerobic-Yogic groups than other two groups. The Aerobic and Yogic programmes were almost equal in bringing down LDL levels.

**HDL:** The serum HDL levels were significantly increased in all the three groups, however the increase was more in Combined Aerobic-Yogic group than the other two groups. The individual Yogic and Aerobic exercise programme were almost equal in increasing the HDL stores.

**Blood pressure:** The experimental programmes were significantly effective in reducing both systolic as well as diastolic blood pressures toward normal values. Combined Aerobic-Yogic programme was however most effective of the three programmes in
bringing down both systolic as well as diastolic blood pressures toward normal values of 120-82 mmHg. Also Yogic programme was more effective than Aerobic exercise programme in bringing down both systolic and diastolic blood pressures towards normal values.

**Diabetes Mellitus:** Results of the study shows that fasting blood glucose was significantly reduced towards normal values of all the three groups after the administration of the three programmes. However, Combined Aerobic-Yogic programme was most effective in bringing down blood sugar levels towards normal values than individual programmes of Aerobic exercise and Yoga. Yogic programme was more effective than Aerobic exercise programme in bringing down blood sugar levels towards normal values.

**Peptic ulcer:** Results obtained from the pre and post analysis of clinical and endoscopic ratings of peptic ulcer clearly shows that Yoga and Combined Aerobic-Yogic programme were almost equally effective in medicating peptic ulcer. However, the mean differences of pre and post peptic ulcers ratings for Aerobic groups was not significant which shows that Aerobic exercise was unable to create a significant effect on peptic ulcer.
Insomnia: The findings of our study clearly show that all the three programmes were effective in medicating, insomnia. The post hoc analysis of data revealed that Aerobic programme was less effective than Yogic and Combined Aerobic-Yogic programme. Yogic and CAY programme were almost equally effective in medicating insomnia.

Yoga and exercise are helpful in controlling psychophysiological reactions, which results in a harmonious equilibrium among over all bodily functions. Yogic and Aerobic programme are helpful in removing anxiety and stress from the individuals mind, he becomes calm and peaceful. Exercise helps in improving organic functions, leading to smooth psychophysiological reaction pathways, which results in a harmonious body mind relationship through proper co-ordination, balance and neuro-muscular control leading to better psychosomatic state of the individual.

CONCLUSIONS

With in the light of the results obtained following conclusions are made –

1. Almost all the three experimental programme of Aerobic exercise, Yoga and Combined Aerobic-Yogic exercises were effective in medicating significantly the various psychosomatic disorders undertaken in this study.
2. In most of the cases Combined Aerobic-Yogic programme was more effective than individual programmes of Yoga and Aerobic exercise.

3. In most of the cases Yogic programme was more effective than Aerobic exercise programme.

4. In case of serum LDL and HDL levels, Yogic and aerobic programmes were equally effective.

5. In case of insomnia and peptic ulcer, CAY and Yogic programmes were equally effective.

6. Aerobic exercise programme did not produce any significant effect in line of medicating the peptic ulcer.

**RECOMMENDATIONS**

In light of the findings of our study followings recommendations are made –

1. The findings of this study should be taken into consideration by the Indian Council of Medical Research for including them in mainstream and alternative medicinal programmes.

2. A project should be undertaken for assessing the effect of various yogic and other exercises on other psychosomatic disorders not included in this study.
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