CHAPTER - III

METHODOLOGY

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Mind's influence over body and it's well being are well established through various studies conducted in different fields of study. Several methods have been developed - ancient techniques have been rediscovered to restore physical well being by gaining control over mental functions or by manipulating them.

The present study is one of such attempts to help patients with essential hypertension. The aim is to reduce physical and mental symptoms of hypertension through scientific application of *Yoga Nidra* (a yogic relaxation technique), Alpha biofeedback training and a combination of the two.

3.1 OBJECTIVES

i. To study the impact of *Yoga Nidra* on the subjects coping behaviour and subsequent change in psychological and physiological response to stress.
ii. To study the impact of alpha enhancement training on the subjects coping behaviour and subsequent change in various psychological and physiological response to stress.
iii. To study the impact of combination of alpha enhancement training and *Yoga Nidra* on the coping behaviour and subsequent change in psychological and physiological response to stress.
iv. To make a comparison between control and experimental groups to draw conclusions regarding effectiveness of the intervention techniques.
v. To assess the differential impact of the intervention technique with respect to change in coping behaviour and subsequent change in physiological and psychological reaction to stress.

3.2 HYPOTHESES

i. There will be no differential impact of the intervention techniques, on Blood Pressure (systolic and diastolic).

ii. There will be no differential impact of the intervention techniques on Pulse rate (Beats/min).

iii. There will be no differential impact of the intervention techniques on Respiration rate (cycles/min).

iv. There will be no differential impact of the intervention techniques on level of Anxiety.

v. There will be no differential impact of the intervention techniques on level of Depression.

vi. There will be no differential impact of the intervention techniques on Positive Task Oriented Coping Style.

vii. There will be no differential impact of the intervention techniques on Negative Task Oriented Coping Style.

viii. There will be no differential impact of the intervention techniques on Positive Defense Oriented Coping Style.

ix. There will be no differential impact of the intervention techniques on Negative Defense Oriented Coping Style.

x. There will be no differential impact of the intervention techniques on levels of Adjustment.

xi. There will be no differential impact of the intervention techniques on Self-Esteem.

xii. There will not be any significant intradimensional shift in personality, under the influence of different intervention techniques.

3.3 SAMPLE

The investigator contacted several physicians in the prominent hospitals and in private practice. The new treatment procedure was explained to them. Most of them cooperated and referred cases to the investigator. The premises of University Health Centre and Narhari Arogya Kendra were used for rendering treatment. The following inclusion and exclusion criteria were adopted to select the sample.

3.3.1 INCLUSION CRITERIA

i. A minimum duration of 6 months of being detected as hypertensive patients
ii. Both male and females were included
iii. Age within 40-50 years
iv. Stabilized drug dose
v. Family history with nil or negligible influence over the diagnosis
vi. Base line proforma showing adequate stress and copying difficulty (For details see 3.7.1 Phase I: Pilot Study)

3.3.2 EXCLUSION CRITERIA

i. Secondary hypertension
ii. Any other associated medical condition
iii. Obesity
iv. Cardiovascular risk factors, such as excessive smoking and alcohol intake

On the whole there were 48 subjects -- 24 males and 24 females. They were further divided into 4 groups. There were 12 subjects in each group -- 6 males and 6 females. The following table describes the distribution of subjects.

Table 3(i) Distribution of Subjects

Type of Subjects	Type of Treatments				Total No. of Subjects
Patients with Essential Hypertension	Training on *Yoga Nidra* (YN)	Training Through Bio-feedback on Alpha Enhancement (BF)	Combination of YN and BF	Control (No Treatment)	
Male	6	6	6	6	24
Female	6	6	6	6	24
Total No. of Subjects	12	12	12	12	48

3.4 DESIGN

It is a 4 by 3 factorial mixed design study, where both between -- subjects (inter-subject) and within-subjects (intra-subject) factors are being analyzed. The following table shows the factorial design.

Table 3(ii) Design of the Study

Intervention	Pre-Assessment	Post-Assessment	Follow Up Assessment
Group I Training on *Yoga Nidra*	Physiological and Psychological assessment before training	Physiological and Psychological assessment immediately after training	Assessment 2 months after completion of the training
Group II Training through Biofeedback on Alpha enhancement	- do -	- do -	- do -
Group III Combined Training on Yoga Nidra and Bio-feedback	- do -	- do -	- do -
Group IV No Training (Control)	Assessment not followed by any training	Assessment after an equivalent time gap	Assessment 2 months after the Post assessment

3.5 INDEPENDENT VARIABLE

Independent variable is the variable, which is manipulated by the investigator in order to determine subject's reaction. In the present study, the three Intervention techniques (Treatment modalities), namely (1) Training on *Yoga Nidra* (2) Training through Biofeedback on Alpha enhancement (3) Combined training on *Yoga Nidra* and training through Biofeedback on Alpha enhancement are used. A detailed description of all the three is given below:

3.5.1 *YOGA NIDRA*

Yoga Nidra is a systematic method of inducing complete mental, physical and emotional relaxation. It is a state of relaxed awareness on the borderline between sleep and wakefulness, allowing contact with the subconscious and unconscious minds. *Yoga Nidra* is the yogic tranquilizer, the natural means to establish harmony and well-being through the entire system. It is a superbly effective system of meditation and for people who are sick or weak, it rejuvenates the nervous system by awakening *prana* and great healing power. *Yoga Nidra* is especially useful in overcoming psychosomatic diseases. There are other similar techniques, which are being used in clinics and hospitals throughout the world.

A General Outline Of The Practice

Yoga Nidra is a practice that generally lasts for twenty to forty minutes. There are separate practices for people suffering from different diseases and for those who want to go deep into the spiritual side of *yoga*. It is a very simple practice -- one can learn it from a tape or record. The author has learnt it from Swami Swarupananda Saraswati a disciple of Swami Satyananda Saraswati who has developed the technique from *Tantra* and is founder of Bihar School of Yoga (Munger). The practice has got seven stages. They are as follows:

(i) The Preparatory Phase

First of all one has to be in a quite room away from any sort of distraction. Clothing should be loose. If instructions are recorded then tape recorder is to be switched on or else a friend may be asked to read out the instructions or even the practitioner may mug them up and instruct himself mentally. Initially instructing oneself on his/her own is difficult as there are chances of drifting into sleep. One has to lie down in *Shavasana* and just follow the instruction mentally. One must keep awake through out the practice for best results.

Yoga Nidra is performed in *Shavasana*, which minimizes touch sensations by eliminating contact between limbs of the body. Finger tips, which are extremely sensitive organs of touch are kept away from the floor by turning the palms of the hands upwards. Sight stimuli are eliminated by simply closing the eyes. The mind is then focused on external sounds. If all sensory impressions were forcibly excluded, then the mind would become rest-less and disturbed. Therefore, the mind is directed to think of external sounds, and to move from sound to sound with the attitude of a witness. After sometime the mind loses interest and automatically becomes quiet. This method of calming the mind is called *antar mauna*. It prepares the consciousness for practicing *Yoga Nidra*.

(ii) Resolve

The next step in *Yoga Nidra* is to choose once own resolve (*Sankalpa*). It has to be done very carefully. The working should be very precise and clear, otherwise it will not penetrate the subconscious mind. By calming the mind through *antar mauna* one prepares the ground for the seed of resolve to be planted. The result depends greatly on one's sincerity and deep felt need to attain the goal of the *Sankalpa*. Time is required, depending on the nature of the resolve and the degree to which it is planted in the mind.

(iii) Rotation of Consciousness

The third step is rotation of consciousness through the different parts of the body, which is neither a practice of concentration nor involves any physical movement. The rotation of consciousness in *Yoga Nidra* proceeds in a definite sequence, beginning with the right thumb and ending with the little toe of the right foot; then in a similar circuit from the left thumb to the little toe of the left foot. Subsequent circuits proceed from the heels to the back of the head, and from the head and individual facial features to the legs. Maintaining this sequence of body parts is quite important in *Yoga Nidra*, and it has to be automatic, spontaneous and thorough.

(iv) Awareness of the Breath

The fourth step is awareness of the breath. In this practice, one simply maintains awareness of the normal and natural breathing process. Awareness of the breath not only promotes relaxation and concentration, but also awakens higher energies and directs them to every cell of the body. It assists the process of *pratyahara* in the practices that follow.

(v) Feelings and Sensations

Next comes relaxation on the plane of feelings and emotions. Feelings that are intensely physical or emotional are recalled or awakened, experienced fully, then removed. Usually this is practiced with pairs of opposite feelings, such as heat and cold, heaviness and lightness, pain and pleasure, joy and sorrow, and love and hate. The pairing of feelings in *Yoga Nidra* harmonizes the opposite hemispheres of the brain, and helps in balancing our basic drives and controlling functions that are normally unconscious. This practice also develops will power on the emotional plane and brings about emotional relaxation by means of catharsis, as memories of profound feelings are relieved.

(vi) Visualization

The last stage of *Yoga Nidra* induces mental relaxation. In this part of the practice, one visualizes the images named or described by the instructor. Since the images used often have universal significance and powerful associations, they bring the hidden contents of the unconscious into the conscious mind. Such images may include landscapes, oceans, mountains, temples, saints and flowers; stories; and descriptions of powerful psychic symbols such as the *chakras*, the *lingam*, the cross or the golden egg.

This practice develops self-awareness and relaxes the mind by purging it of disturbing or painful material. It leads the mind to concentration or *Dharana*. In advanced stages, visualization develops into *Dhyana* or pre-meditation. Then there is the conscious experience of the visualized object in the unconscious, the distinction between conscious and unconscious dissolves and distracting images cease to arise.

(vii) Ending the Practice

The visualization practice is usually finished with an image that evokes profound feelings of peace and calmness. This makes the unconscious mind very receptive to positive thoughts and suggestions. Therefore, the practice of *Yoga Nidra* ends with a resolve. This direct order from the conscious mind to the unconscious is the seed enabling one to radically change one's attitude, behaviour and destiny. It is very important that the resolve be stated clearly and positively. This will give the mind strength and a positive outlook. One should have sincere faith that the resolve will be effective. This faith strengthens the effect of the resolve on the unconscious mind, so that the resolve will be effective and will become a reality in one's life.

The practice of *Yoga Nidra* is concluded by gradually bringing the mind from the condition of psychic sleep to the waking state.

3.5.2 BIOFEEDBACK THROUGH ALPHA ENHANCEMENT

We have already discussed quite in detail about brain waves. As we know alpha waves (frequency range 8-13 Hz) depicts a relaxed wakeful state of mind, and enhances mental receptivity. There are various methods developed by number of researchers to induce at will and to sustain the alpha state for a longer period. In this particular study EEG (Alpha) Biofeedback has been used to train the subject for enhancement of alpha waves. Method of training will be discussed later in this chapter.

3.5.3 COMBINATION OF YOGA NIDRA AND ALPHA ENHANCEMENT

Enhancement of alpha state increases suggestibility of the mind, whereas *Yoga Nidra* suggests physical and mental well being. As such alpha is expected to increase when one practices *Yoga Nidra* perfectly. Hence looking into the compatibility of the two techniques they are combined here. In this procedure also the EEG Alpha Biofeedback was used along with investigator's instructions on *Yoga Nidra*. Method of training will be discussed later on.

3.6 DEPENDENT VARIABLES

The variables, which are measured to find out their dependability on the independent variables, are known as dependent variables. Selected physiological variables associated with hypertension and a few selected psychological variables related to coping behaviour served as dependent variables in the present study.

3.6.1 PHYSIOLOGICAL VARIABLES

(i) Blood Pressure (Systolic & Diastolic)

As hypertension is a disorder indicating raise in BP bringing down the BP reading is one of the prime objective of any treatment for hypertension. Hence it is treated as one of the dependent variable in the present study. We have already discussed a lot about systolic and diastolic BP Here we are going to discuss the measurement of BP.

Measurement of Blood Pressure

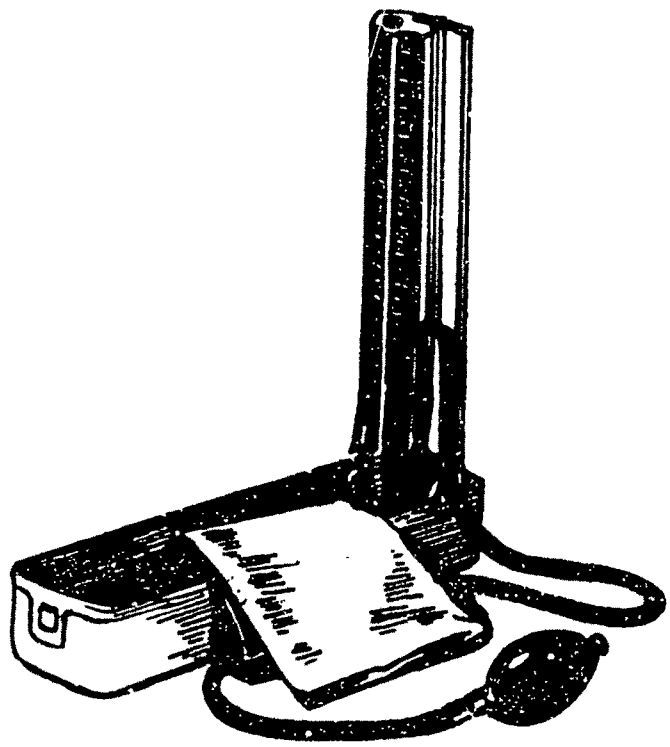
It was to be almost 70 years before an Italian Physician Scipion Rivorokki invented a measuring instrument, which had an arm cuff. This solved the problem of artery-puncture. Rivorokki argued, and rightly so that the pressure of the arm-cuff that stops the flow of blood into the forearm should be equivalent to the blood-pressure. The arm cuff was connected to two things: to an air-pump and to a mercury filled tube. Rivorokki first snugly tied the cuff around a person's arm. He then placed his fingers on the wrist of the person, where he could feel the pulsations (of the blood) in the 'radial' artery. Finally, with the air-pump he used to build up pressure inside the arm cuff. He would consider that pressure (as observed in the mercury-filled tube) as the blood pressure, which made the pulsations in the radial artery to stop. Rivorokki did not realize that this was only the pressure of the blood while the heart was contracting.

Finally in 1905 AD, a Russian physician Nicolai Korotcoff, using the stethoscope, measured both the pressures i.e. when the heart was fully contracted and when the heart

was fully relaxed. Till date this has been considered to be the standard method of taking a patient's blood pressure.

At present even though there are several other sophisticated BP measuring devices available in the present study a mercury manometer, known as sphygmomanometer (Fig. 3.1) has been used to measure blood pressure. The inflatable arm cuff is applied round the upper arm, snugly but not too tightly, leaving a clearance of two inches between the lower end of the cuff and the cubital fossa, at the elbow. This cuff is inflated using a small hand pump. The brachial artery pulse is located in the cubital fossa at the elbow by pulsation. It lies on the medial side of the biceps tendon, and the arterial pulsation can be often seen if the arm is fully extended. It is to be noted that a stethoscope can not be used to locate the brachial artery since the flow in this artery is laminar, and no sounds will be heard until the cuff has been inflated.

Fig. 3.1 The Sphygmomanometer



The radial pulse is next palpated at the wrist, and whilst the fingers of one hand are on this pulse, the other hand is used to inflate the cuff to a pressure well above the point at which the radial pulse disappears. This ensures that the cuff has been inflated to well above any silent interval.

The stethoscope is then placed over the brachial artery, and the pressure in the cuff slowly lowered. In order to maintain a steady fall of pressure the release valve must be opened more and more as the pressure falls.

As the pressure descends, no sounds are heard until the systolic blood pressure is reached, when tapping sounds, corresponding to the heart rate, are heard in the stethoscope. The pressure at which these sounds appear for the first time is noted. This gives the systolic blood pressure. As the cuff pressure continues to be reduced, the sounds become louder and louder, but at the diastolic pressure they suddenly change their quality and become muffled. A little lower down they finally disappear. This point at which the sounds become muffled is taken as the diastolic pressure. Pressures to nearest 2 mmHg is recorded. Always cuff is to be deflated before repeating measurement.

Mode of Measurement: For the present study the investigator used mercury sphygmomanometer to measure the blood pressure of the subjects before and after each session.

(ii) Pulse Rate

Next physiological variable, which served as dependent variable is pulse rate. One of the common symptom of hypertension is palpitation. Other mental symptoms such as nervousness and depression are also closely linked with palpitation. Reduction in heart rate also reduces nervousness, anxiety, etc.

The steady rhythm of the heart-lubb-dub, lubb-dub - which can be heard by placing our ear on somebody's chest or through the doctors stethoscope is mainly due to opening and closing of different valves inside the heart while it receives and pumps out blood. This it does, on an average, 72 times a minute, equal to the pulse rate.

Mode of Measurement: For the present study subjects radial pulse rate was measured manually by the investigator before and after each session.

(iii) Respiration

Physiologically breathing has three main functions:

- To take in oxygen
- To give off carbon-dioxide
- To regulate the pH level of the blood.

The lungs completely fill the thoracic cavity and breathing is brought about by increasing and decreasing the size of the cavity. The process of alternately increasing and decreasing the size of the chest is under the control of a collection of nerve cells situated in the brain, at the reticular formation of the medulla known as the respiratory center. Nerves run from this center to respiratory muscles. Inspiration is brought about by the contraction of the diaphragm muscle, which moves downwards and compresses the abdominal contents. Expiration is brought about by the relaxation of the muscles. The elastic recoil of the lungs and chest wall returns the chest to the resting respiratory level. An inspiration followed by an expiration makes a breathing cycle. Normally 15-20 such cycles takes place within a minute.

The breath and the heart are linked together. The mind is also linked to the breath and the heart. Normally the respiratory and cardiovascular systems (lungs, heart and blood vessels) work automatically, although they can be consciously governed with will power and awareness. As a link between heart and lungs, the nervous system plays most important part in monitoring blood pressure and blood chemistry to ensure that every thing is functioning smoothly. Any changes are detected by sensitive baroreceptors for pressure and chemoreceptors for detecting the level of oxygen are sent through the sympathetic or parasympathetic nervous systems to either speed up and slow down the lungs and heart and to adjust the peripheral resistance.

Abdominal or yogic breathing has been tested by Dr. Motoyama (1976), Director of the International Association of Religion and Parapsychology in Japan. He showed that contraction and release of the abdominal muscles heightens mental and physical vitality. The plethsymograph of subjects practicing deep abdominal breathing in an erect sitting position indicates an improvement in over all blood circulation.

EEG tracings of brain waves during abdominal breathing show an increase in alpha waves, indicating deep relaxation of the nervous system in this practice. Motoyama states: "*Pranayama* is also seemingly able to hinder the occurrence of angina pectoris. Certain hospitals have been recommending their heart patients, particularly with angina pectoris, to begin abdominal breathing when they feel an attack coming on. The reports are that this practice has been successful and that it is being continued."

Mode Of Measurement: By observing abdominal movement respiratory rate was measured. One expansion and one contraction of abdominal muscles were counted as one cycle of breathing.

The investigator learnt to measure various physiological parameters under the supervision of medical personnel at health centre, M S. University, Baroda.

3.6.2 PSYCHOLOGICAL VARIABLES

A few psychological symptoms commonly seen in essential hypertension patients have been assessed three times. They served as another set of dependent variables. Each of them is discussed below:

(i) Anxiety

The sensation of anxiety is commonly experienced by virtually all human beings. The feeling is characterized by a defuse, unpleasant vague sense of apprehension, often accompanied by autonomic symptoms, such as headache, perspiration, palpitation, tightness in the chest, and mild stomach discomfort. An anxious person may also feel

restless, as indicated by an inability to sit or stand still for long. The particular constellation of symptom present during anxiety tends to vary among people.

Anxiety is often future oriented and occurs in relationship to symbolic dangers. That is it occurs when we become concerned about a future event and symbolic danger is sensed. Anxiety is an alerting signal; it warns of impending danger and enables the person to take measures to deal with threat. Fear a similar alerting signal should be differentiated from anxiety. Fear is in response to a threat that is known, external, definite, or non-conflictual in origin, anxiety is in response to a threat that is unknown, internal, vague, or conflictual in origin. When considered simply as an alerting signal, anxiety can be considered basically the same emotion as fear. Anxiety warns of an external or internal threat; it has life saving qualities. At a lower level, anxiety warns of threats of bodily damage, pain, possible punishment, or the frustration of social or bodily needs; of separation from loved ones; of a menace to ones success or status; and ultimately of threats to ones unity or wholeness. It prompts the person to take necessary steps to prevent the threat or to lessen its consequences. Thus, anxiety prevents damage by alerting the person to carry out certain acts that forestall the danger.

Whether an event is perceived as stressful depends on the nature of the event, and on the person's resources, psychological defenses, and coping mechanisms. All involve the ego, a collective abstraction for the process by which a person perceives, thinks and acts on external events or internal drives. A person whose ego is functioning properly is in adaptive balance with both external and internal worlds; if ego is not functioning properly and the resulting imbalance continues long enough, the person experiences chronic anxiety.

Whether the imbalance is external, between the pressures of the outside world and the person's ego, or internal impulses (e.g. aggressive, sexual, and dependent impulses) and conscience, the imbalance produces a conflict. Conflicts caused by external events are usually interpersonal, whereas those caused by internal events are intrapsychic or intrapersonal. A combination of the two is possible. Interpersonal and intrapsychic

conflicts are, in fact usually combined because human beings are social and their main conflicts are usually with other people.

The experience of anxiety has two components (1) the awareness of the physiological sensations (such as, palpitations and sweating) and (2) the awareness of being nervous or frightened. In addition to its motor and visceral effects, anxiety affects thinking, perception and learning. Anxiety tends to produce confusion and distortion of perception, not only of time and space but of people and the meaning of events.

An important aspect of emotion is their effects on the selectivity of attention. Anxious persons are apt to select certain things in their environment and overlook others in their effort to prove that they are justified in considering the situation frightening and in responding accordingly. If they falsely justify their fear, their anxieties are augmented by the selective response, setting up a vicious circle of anxiety, distorted perception and increased anxiety. If alternatively they falsely reassure themselves by selective thinking, appropriate anxiety may be reduced, and they may fail to take the necessary precautions.

Anxiety is a significant force in directing an individual's attention to a particular part of the body and often that is cardiovascular system. The close association of anxiety and the heart is well appreciated over centuries. No wonder, we even in our day to day expressions use phrases such as 'my heart is sinking', 'heart coming to mouth', 'from the bottom of the heart', 'the heart throbs' and many more such terms implicating the interrelationship of emotions and the heart. The relationship between anxiety with depressive symptoms and somatic symptoms is complex. Patients with somatic complain for which no organic cause can be found, experience more anxiety than do normal subjects without such complaints. Choudhary et. al. (1994) have found thai patients with hypertension have significantly higher levels of anxiety and depression as compared to normal subjects and patients with non-psychosomatic medical diseases. The high level of anxiety and depression may act as major factors in the formation of symptoms in the same way as in other psychosomatic disorders, the only difference, being the organ vulnerability.

Mode of Measurement: Anxiety level of the subjects was measured with the help of Hamilton's Anxiety Scale. The scale is presented in Appendix - B.

(ii) Depression

Depression is also a mental state experienced by most people during certain stressful encounters. Depression was thought of as a rather intense and prolonged sadness. Aaron Beck and James Page both describe depression as having five major components indicated below.

i. A prolonged sad or apathetic mood demonstrating a negative self concept by putting oneself down a lot
ii. Excessive self-blame or self-criticism of one's problems or actions
iii. Showing a desire to avoid other people and social activities or losing interest in them
iv. A loss of sleep, appetite, and sexual desire
v. An inability to function properly, seen in slow body movements, a general loss of energy and drive, difficulty in making decisions, and an inability to get started, to concentrate and to work.

Depression is much more intense and longer lasting than a general unhappy or sad feeling. In such a case the anxiety of the individual turned inward in the form of depression. Such an unusual sadness with long lasting intensity leads to disturbance in the normal psychological functioning of the individual. For example, failure in business, death of a near and dear one or breakdown in close relationship may lead to temporary depression, which is an exaggeration of normal response. It may continue for weeks and months; but finally it is cleared up.

Though every individual comes across such stress situation and unfortunate happenings in the go of life and feels pain, he/she faces them with courage, fortitude, and stamina. But in case of clinically significant depression reaction is with excessive sadness and the most important aspect of it is that it continues for too long a period. Where the individual is unusually apprehensive, have diminished activity lowered self confidence and are over dependent, at times over demanding on others. There is also difficulty in

concentrating. The loneliness and despair in life are the chief characteristic symptoms. The capacity to tolerate frustration and stress is low in case of individuals with clinically significant depression. The unpleasant and stressful experiences of the past may further help in exasperating the feeling of anxiety insecurity and finally depression. The secondary gains obtained from the depressive symptoms are sympathy, attention and support, which may help in increasing the sense of security of the patient of course temporarily. Clinging to the secondary gains often fosters psycho-somatic problems. Studies (Choudhary et. al. 1994) have shown that high level of depression is seen in case of essential hypertension patients.

Mode of Measurement: Level of depression in the subject was measured with the help of Hamilton's depression scale. The scale is presented in Appendix - C.

(iii) Coping Style

A number of taxonomies of coping behaviour have been developed. Rudolf H. Moos (1993) has developed the Coping Responses Inventory (CRI) composed of eight scales that measured eight different types of coping responses to stressful life circumstances. The inventory considers the orientation or focus of coping and divides coping responses into approach and avoidance responses. Each of these two domains of coping responses is divided into two categories that reflect cognitive or behavioural coping methods. In general, approach coping is problem focused; it reflects cognitive and behavioural efforts to master or resolve life stressors. In contrast, avoidance coping tends to be emotion focused; it reflects cognitive and behavioural attempts to avoid thinking about a stressor and its implications, or to manage the affect associated with it.

A second taxonomy for classifying coping strategies has been developed by Lazarus and his colleagues (Lazarus et. al., 1980). Whereas the taxonomy presented by Moos and Tsu (1977) refers specifically to coping with stress related to physical illness. Lazarus's classification system is more general. Lazarus and Lounier (1978) classified coping efforts according to *mode* (direct action, action inhibition, information search or intrapsychic) and *function* (instrumental alteration of the problem or palliative regulation

of the problem or palliative regulation of the emotional response). They noted that each of the major coping modes subsumes a wide range of discrete coping strategies.

Larazus and Launier's (1978) scheme takes into account coping resources as well as coping strategies. The former refers to relatively stable factors that affect both, the range of coping options available to an individual and the predisposition to utilize available responses. The Lazarus group - Folkman, Schaeffer, and Lazarus (1980) identified six categories of coping resources, some inherent in the person (health and energy, morale, problem-solving skills, systems of beliefs) and some environmentally based (social support, material resources). Pearlin and Schooler (1978) also discussed stable coping resources and liabilities. They presented data that led them to identify three dimensions (self-degeneration, lack of sense of mastery, and lack of sense of positive self-esteem) associated with subjective stress levels in a variety of personal and vocational contexts.

As discussed earlier (in chapter I) broadly coping responses can be divided into two categories. Firstly strategies that are active in nature and oriented towards confronting the problem which has been referred as 'Task oriented coping style' in the present study. Secondly, there are strategies which entail an effort to reduce the tension by avoiding dealing with the problem. Mostly various types of defense mechanisms are used in the later category of coping response. In the present study this kind of coping response is referred as defense oriented coping pattern/style.

Both of the above mentioned strategies have their own pros and cons. Over use or inappropriate use of any of them gives faulty end results in the form of increased stress level in life. At times such strategies reduce a particular stress instantly but pave way for some other kind of stress in the long run. Accurate and appropriate use of the same helps the individual in overcoming day to day stress and tensions with satisfaction. Hence, what ever may be the way of coping, the end result is important. Accordingly they have been further categorized as coping styles with positive or negative effects. So in the present study coping response has been categorized into four types.

Positive Task Oriented (PTO) Coping Style: When the individual attempts to cope with problem situation by confronting the situation and the end result is self promoting and individual is satisfied on long-term basis.

Negative Task Oriented (NTO) Coping Style: When the individual's attempt to cope with problem situation is task oriented (i.e. active confrontation) but the end result is self defeating, leaving the individual dissatisfied.

Positive Defense Oriented (PDO) Coping Style: When individual avoids dealing with problem to reduce the tension. He/she may be using some of the mature defense mechanisms to do so, and the end result is self promoting and satisfactory to the individual.

Negative Defense Oriented (NDO) Coping Style: When the individual avoids dealing with problems to reduce tension. May be he uses some of the immature defense mechanisms or over uses them and generates more tension or accumulates tension. As a result of which end result is self defeating and the individual is dissatisfied, jeopardized or in vicious circle.

Mode of Measurement: The investigator has prepared a tool comprising 40 situations of daily life, which are likely to induce stress. Response from the subject were collected through a structured interview by the investigator. Response to each situation were identified in terms of the above mentioned coping styles. Subjects mode of coping was assessed by adding up separately all the responses in each category.

Development of the Tool

The investigator prepared a list of 50 situations faced by common man in daily life. After consulting 8 experts (one general practitioner and a physiologist working actively in the field of stress related problems, two, psychiatrists, four psychologists), the list was circulated among 200 adults (100 males and 100 females). The purpose was to identify common stressful situations faced by people in daily life. Each situation described in the list was followed by three questions indicating mild, moderate and severe

level of stress that the situation might induce. The situations that were identified as highly stress inducing by more than 50% of the respondents were selected for the study purpose. Rest of the items were rejected. Finally there were 40 items, which were used for identifying coping style of the subjects.

Administration & Interpretation

The responses from the subjects were collected in the form of a structured interview. The investigator described one by one all the 40 situations to respondent. After going through the description of the situation, the subjects were asked to describe how they would react to the situation if it happens to them. After describing their reactions they were further asked to describe how they would feel after reacting in the said manner. Subjects' responses were noted down and classified into the 4 categories namely (i) Positive Task Oriented (ii) Negative Task Oriented (iii) Positive Defense Oriented (iv) Negative Defense Oriented responses. The tool is presented in Appendix - D.

(iv) Adjustment

Adjustment is often used synonymously with the term adaptation. Adaptation represents individual's ability to cope successfully with the demands of the environment. Some of the famous spiritual leaders have concluded the only thing that is permanent in life is 'CHANGE'. No doubt the eternity of this truth. The individual is constantly engaged in adapting to changing internal and external pressures emerging out of biological and psychological needs. To enhance the quality of the life people sometimes change themselves or their environment. They learn new skills and interests or modify their environment to match those skills and interests.

Some authors (e.g. A.F. Grasha and D.S. Kirschenbaum) prefer to apply the term adjustment to only one aspect of adaptation. Each individual uses a range of relatively ineffective to highly effective responses to help one to adopt. The terms adjustment and competence cover various aspects of that continuum. In practice, this often means that adjustment is concerned with matching ones current abilities to the demands of living. The goal is to do things that will allow one to "get by" with a minimum amount of stress.

There are number of ways of describing how people just meet the demands of their environment or adjust. How well people do these things, has implications for how adequate they believe they are and the amount of satisfaction they experience in their lives. Based on what have just been said, it can be summarized by stating that people are adjusting adequately if they show the following behaviours and personal characteristics:

- Are able to do things to get by in life.
- Have behaviours that are relatively free of "symptoms" of serious problems in living.
- Make relatively appropriate responses to events in their lives.
- Have not learned non-adaptive behaviours or are able to modify existing skills or learn new ones to handle events in their lives.
- Are able to interact with other people and can respond to the demands that organizations place upon them. In both cases, people are still able to maintain some sense of independence and autonomy.
- Are able to meet their basic needs.

Mode of Measurement: To assess subjects level of effective adjustment in the present study Bell's adjustment inventory (Adult Form - 1938) was used. It yields scores on five separate measures of personal and social adjustment, namely, home adjustment, health adjustment, social adjustment, emotional adjustment and occupational adjustment. In general low scores indicated satisfactory adjustment and high scores indicated unsatisfactory adjustment.

The tool is presented in Appendix - E.

(v) Self Esteem

Self esteem refers to one's general acceptance of oneself, and it affects physical and psychological health and coping capabilities it is also related to one's characteristic sense of self-efficacy, the belief that one is personally responsible for bringing about a particular outcome. One of the central issues of adjustment relates to identify, the collection of generalizations we make about ourselves. Identity is made up of several

components: the physical self, our image of the physical aspects of our body; the social self, the various roles are play in life; and the personal self, that private part of ourselves that is apparent only to us. The social self is a reflection of the looking-glass self, the view of one's self that is provided by society and by other specific, significant others. We use social comparison process to obtain information relevant to the looking-glass self.

Although all of us, on occasion, go through times of low self-esteem (e.g. following an occasional failure) some people routinely feel low in self-esteem. In extreme cases, the result can be physical illness, psychological disturbance, or a general inability to cope with challenges. People with low self-esteem may also find themselves in a cycle of failure that is difficult to brake. One way of braking such a self-defeating pattern is to increase an individual's sense of self-efficacy, the belief that one is personally responsible for and can regulate one's own behaviour, thereby bringing about positive outcomes. People with high self efficacy tend to exert greater effort when faced with a challenge, which in turn increases the chances of success in dealing with it.

In sum, self-efficacy can help promote success in meeting the challenges of life. When people are convinced that they can indeed meet challenges, the resulting sense of self-efficacy will most likely place them in a cycle of success.

Mode of Measurement: To assess subject's self-esteem Battle's Culture-free Self Esteem Inventory - Form AD (1981) was used. It has 3 forms. Form A & B are for children. Form AD is for adults. The inventory refers to the perception, the individual possesses about his own worth. The tool is presented in Appendix - F.

(vi) Personality

Contemporary psychotherapy is not merely concerned with the cure of disease or adjustment processes but it includes change and growth of the individual. Implicitly and explicitly in the work of any psychotherapist there is an underlying theory of personality Most of the major theories of personality meaningfully describe a person as he is, and explain psychological distress and its treatment. To be an effective psychotherapist one must work within the context of a cohesive theory of personality.

The study of personality emphasizes normal individual variation. Definitions of personality vary from one theorist to the next, but most agree that it consists of distinctive patterns of behaviour (including thoughts and emotions) that characterize a persons adaptation to the situations of his or her life. Theories about personality can be grouped into those which emphasize types and traits, dynamic processes, learning and conditioning, or the humanistic perspective. Detail discussion of each of them would be beyond the scope of the present study.

In the present study both personality types and traits have been taken into consideration. Types indicate classes of individuals said to share a common collection of characteristics. Traits are characteristics that lead people to behave in more or less distinctive and consistent ways across situations. In the present study greater emphasis is on traits.

Mode of Studying Personality: In the present study personality has been studied with the help of three tools. They are -

(i). Enneagram

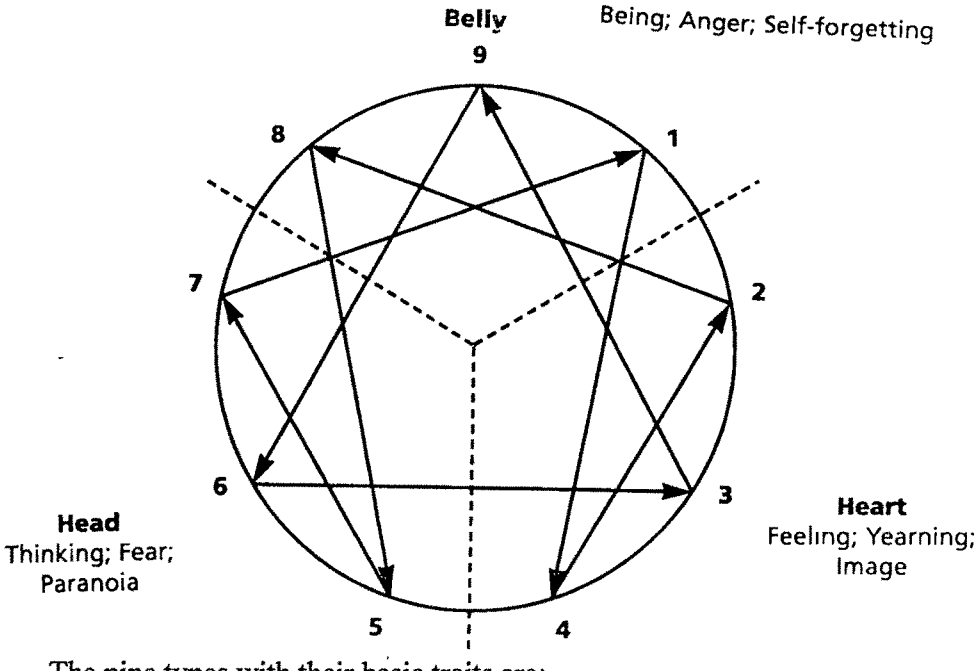
It is one of the oldest tool for personality analysis. Its origin goes back to 2500 BC The enneagram (from the Greek *enneas* - nine, *gramma* - something written) is an ancient and beautifully accurate description of human personality in all its diversity and of how personality is directly linked to each persons spiritual self.

Not a religion, it encapsulates and unites apparently different principles found in all major faiths. Now psychologists of various schools have found it corresponds uncannily close to modern personality descriptions. Simple, accurate and profound it links, explains and puts in context disparate elements of one self and how one works, which otherwise have taken years to understand.

The enneagram describes nine personality types, none better or worse than another, yet recognizably and radically different in their way of responding to the world.

BRIEF DESCRIPTION OF THE NINE TYPES

Fig. 3.2 The Enneagram Circle



The nine types with their basic traits are:

i. (One): is principled, orderly, perfectionist, and self-righteous.

ii. (Two): is caring, generous, possessive, and manipulative.

iii. (Three): is adaptable, ambitious, image-conscious and hostile.

iv. (Four): is intuitive, expressive, self-absorbed, and depressive.

v. (Five): is perceptive, original, detached, and eccentric.

vi. (Six): is engaging, committed, defensive, and paranoid.

vii. (Seven): is enthusiastic, accomplished, uninhibited and manic.

viii. (Eight): is self-confident, decisive, dominating and combative.

ix. (Nine): is peaceful, reassuring, complacent, and neglectful.

The shape of the diagram (Fig 3.2) is central to the Enneagram model. Each person inhabits one basic type, which does not change. However, the line connecting the points show how each type changes in extreme stress and in security. People fluctuate among the healthy, average and unhealthy traits that make up their personality type. Whilst the external circle may bring in a flavour of the types on either side. Each type also has their distinct variants. That is, human beings have three main ways of

experiencing the world: thinking, feeling, and sensing The Enneagram model, and every mystical tradition, recognizes three physical centres of perception and intelligence which mediate these experiences, located in the head, the heart and the belly. Everyone uses all three, but each type favours one of them as their main channel for perceiving and responding to events.

The diagram divides into three traits each corresponding to one of the centres. Each center has its particular way of experiencing life as well as the 'negative' emotion and concerns associated with it. The three types within each triad are the ones, which favour that centre and reveal different ways of dealing with those specific issues.

In the present study for identifying types the investigator has used the questionnaire and method given by Renee Baron & Elizabeth Wagele in their book "The Enneagram Made Easy." To find out the fluctuations of traits within the Enneagram type, the investigator further developed another set of 9 questionnaires (one for each type). Each consisting of 25 questions. The questions were selected on the basis of Karen Webbs Suggestions to each type to help themselves in her book "The Enneagram" and suggestions from the book "Enneagram Made Easy" by Renee Baron and Elizabeth.

Both the tools are presented in Appendix - G.

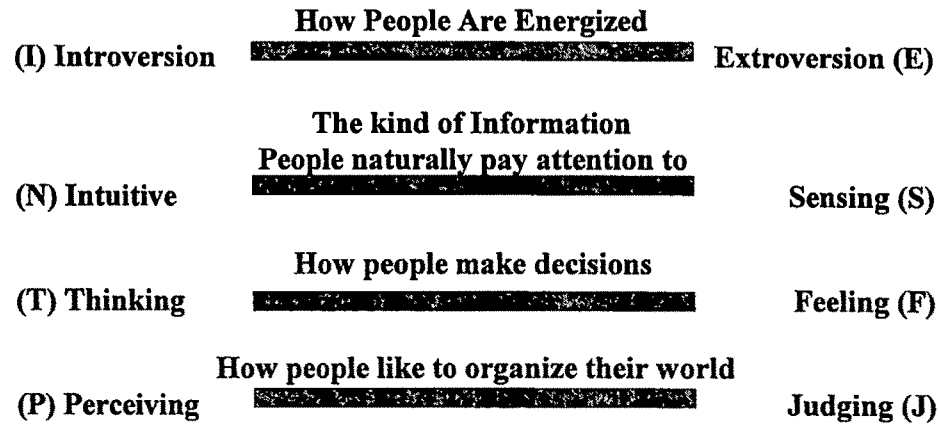
(ii). Personal Style Inventory (By R. Cralg Hogan and David W. Champagne)

The 32 item personal style inventory is designed to measure a person's Jungian typology, a construct first described by Jung (1921) and then later elucidated by Myers (1962). Hogan (1979) has completed a manual to accompany the inventory, explain the typology, and suggest uses for it's various human organizations.

The Typology

There are four components, or 'dimensions', that make up a personality type. They are: how people are energized, what kind of information they naturally notice and remember, how they make decisions, and how they like to organize the world around

them. As it has been observed, each of these dimensions deals with an important aspect of life, that is why type provides such accurate insights into one's behaviour. It helps to picture each of these four dimensions as a scale - a continuum between two extremes - as follows:



It can be noticed that there is a midpoint in the center of each scale. This is important because every one has an inborn, natural preference for one side or the other on each of these dimensions. When one is using one's preferred side on any of the four type dimensions - like using one's preferred hand - one is doing what comes naturally. And when the person is required to use the opposite side, it takes a lot of extra work and the person may not be as good at it; the experience is usually not as satisfying. Another way to think of it is that every one is primarily one way or the other, but not exclusively that way.

Because there are four type dimensions, and each person has one preference per dimension, there are sixteen different possible type combinations. A personality type is really a four-letter code that reflects a person's preferences on each of the four dimensions. For example a person can be an ISTP (Introverted, Sensing, Thinking, Perceiving) type, or ENFJ (Extroverted, Intuitive, Feeling, Judging) type, or one of fourteen other type combinations. While a person's typology cannot be changed to its opposite, each person can learn to strengthen the weaker dimensions to some extent and to develop personal life strategies to overcome problems that result from the weaknesses.

The tool is presented in Appendix - H.

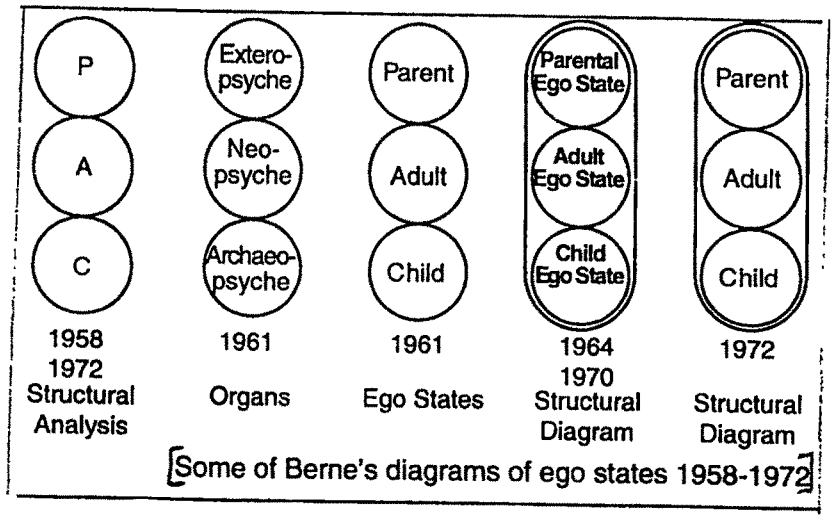
(iii). The Ego States

An ego state is a part of our personality. Freud described this as the super ego, ego, and id. Eric Berne describes the parent, adult and child ego state. In psychoanalysis and transactional analysis, how the ego-states interact with each other determines behaviour of the person.

Basis of identification of ego states in the present study has been borrowed from Eric Bern's "Transactional Analysis," which is often called TA. TA suggests that people's transactions or communications with other people facilitate or hinder their ability to adapt. Transactional analysis is a full-fledged method of psychotherapy. There are a number of elements of TA theory. As the present study is not a complete study of TA, we will restrict our discussion to one of its basic elements, namely 'structural analysis', which analyses individual personality.

Each person has three ego states which are separate and distinct sources of behaviour: the Parent ego state, the Adult ego state, and the Child ego state (Parent, Adult and Child with capital P, A and C respectively are indicators of ego states). These are not abstract concepts but realities. The three ego states (Fig 3.3) are defined as follows:

Fig. 3.3 Berne's Diagrams of Ego States



[Some of Berne's diagrams of ego states 1958-1972]

The Parent Ego State

It contains the attitudes and behaviour incorporated from external sources, primarily parents. Outwardly, it often is expressed toward others in prejudicial, critical and nurturing behaviour. Inwardly, it is experienced as old parental messages, which continue to influence the inner child.

The Adult Ego State

Adult ego state is not related to a persons age. It is oriented to current reality and the objective gathering Parent Ego State of information. It is organized, adaptable, intelligent, and functions by testing reality, estimating probabilities and computing dispassionately.

The Child Ego State

Child ego state contains all the impulses that come naturally to an infant. It also contains the recordings of the child's Child Ego State early experiences, responses, and the "positions" taken about self and others. It is experienced as "old" (archaic) behaviour from childhood.

When we are acting, thinking, feeling as we have observed our parents to be doing, we are in our parent ego state. Parental transactions are often of a nurturing or prejudicial nature. These patterns are used in transacting with grown-ups as well as with children. For example, the nurturing part of the parent is appropriately used to respond to a co-worker who is hurt or ill or in some way suffering a temporary dependency need. The parent ego state is inappropriately used when nurturing, criticism or discounting are forced upon another person who neither wants it nor needs it.

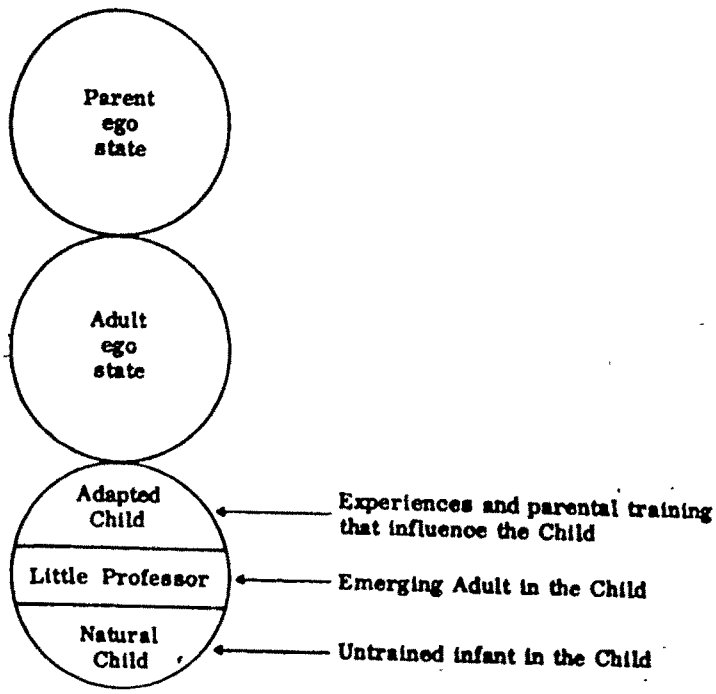
When we are dealing with current reality, gathering facts, and computing objectively, we are in our adult ego state. When we are feeling and acting as we did when we were a child, we are in our child ego state. The child ego state develops into three discernible parts: the Natural Child, the Little Professor, and the Adapted Child.

The Natural Child is that part of the child ego state that is the very young, impulsive untrained, expressive infant still inside each person. It is often like a self centered, pleasure loving baby whose response is cozy affection when needs are met or angry rebellion when they are not met.

The Little Professor is the unschooled wisdom of a child. It is that part of the child ego state that is intuitive, responding to non-verbal messages and playing hunches. With it, a child figures thing out, things such as when to cry, when to be quite, and how to manipulate mama into smiling. The Little Professor is also highly creative in the child.

The Adapted Child is that part of child ego state that exhibits a modification of the natural child's inclinations. These adaptations of natural impulses occur in response to traumas, experiences, training and most importantly, to demands from significant authority figures. For example, a child is naturally programmed to eat when hungry. Shortly after birth, however, this natural urge may be adapted, so that the child's eating schedule is determined by the child's parents. A child would do and take, what wanted naturally on impulse, but may be adapted to share and to be courteous towards others in ways also determined by parents. Fig. 3.4 shows second order diagram of child ego state.

Fig. 3.4 Second Order Diagram Of Child Ego States



In some people the ego state boundaries may be so rigid that psychic energy may be blocked and unable to flow easily from one ego state to another. When this happens, it is known as exclusion of ego state. In order to emphasize that physical, mental and spiritual health means having all the ego states available, without any one state overwhelming the whole or being excluded from the whole.

In the present study the investigator studied the ego states of the subjects three times (i.e., at pre, post and follow up levels). The subjects were not given any knowledge or counseling regarding TA or ego state. Purpose is to find out the impact of different intervention techniques on ego states. An ego state inventory prepared by Prof. Keith C. D'Souza, XLRI Jamshedpur has been used to identify ego states. The tool is presented in Appendix-I.

3.7 PROCEDURE

The investigator approached different medical set ups and private practitioners the therapeutic package and the purpose of the study was explained to them, with a request to refer cases for the study purpose. Premises of M.S. University (Baroda) Health Center and Narahari Arogya Kendra (Baroda) were used for conducting the therapeutic sessions. The study comprises of four phases. Each one of them needs to be discussed separately.

3.7.1 PHASE I: PILOT STUDY

- A Pilot study was conducted to set the limit for level of stress to be accepted as inclusion criteria.
- To have an estimate of time required for the treatment sessions.

A base line proforma was used to identify stressors and stress reactions. The proforma checks stressors in 6 different areas, namely (i) physical (ii) family (iii) job and careers related (iv) interpersonal (v) political environmental and socio-economic (vi) emotional. It also checks the physiological and psychological stress reactions.

The proforma was first circulated among 50 adults (25 females and 25 males, age - 25 to 50 years) those who are not having any chronic medical problems and history of less frequent medical help. It was found that average number of stressors identified was 5. Most of them reported no persistent stressor. Highest number of stressors reported was 6. For stress reaction it was observed that average of reactions identified was 8 (both physiological and psychological reactions taken together).

So it was decided to include those subjects for the study who reported 6 or more stressors and 8 or more reactions to stress with severity. The proforma is presented in Appendix - A.

Four patients who were interested in the treatment but did not fulfill the inclusion criteria's were selected and three sessions to each one of them was given based on 3 different treatment modalities and control conditions.

It was found that the psychological assessments took approximately 3 to 4 hours on an average. Minimum 30 minutes to maximum one hour per assessment.

Subjects were comfortable in learning the techniques in chunks. Such as, first the theoretical explanation and demonstration, then the demonstration with some basic performance, and finally the full exercise.

Based on their feedback it was decided to have three consecutive days sessions at first as baseline sessions. During which on the first day subjects were assessed on three scales, namely, Hamilton's Anxiety and Depression scales, and coping style, during the first half of the session. The second half was devoted to orientation of the therapeutic technique, with relevant demonstration. Inventories for adjustment self-esteem and enneagram were given to them to fill at their leisure time and hand over the answer sheets to the investigator within next two visits.

On the second day, movement within enneagram, 'Ego states' and 'Personal styles, were assessed during first half of the session and then the subject was helped to perform respective therapeutic exercise.

In the third session, if some part of the assessment was incomplete or so, then subjects were asked to complete it. Then in the second half of the session they were helped to perform the full half an hour exercise as per the respective therapeutic plan.

Every day Blood Pressure, Pulse rate, and rate of respiration of the subject were measured, as soon as they came and just before they left. They were also given some time to share their experiences during the session and otherwise also. Their doubts and questions were also clarified by the investigator.

3.7.2 PHASE II: ASSESSMENT

As mentioned earlier the pre intervention assessment was done during the baseline study (i.e. first three consecutive days sessions). Averages of the three readings of BP, Pulse rate and Respiration rate, were recorded as baseline readings. Anxiety and depression scales were filled in through discussion with the subject, more or less like an interview. As described earlier the assessments on adjustment, self esteem and enneagram were done by first explaining the purpose of the tool to the subjects and orienting them about how to fill it. Then the inventories were given them to fill at their leisure. Subjects were made to fill in the ego state and personal style inventories at the set up in the presence of the investigator.

The same procedure was repeated twice -- once immediately after the intervention (i.e., after 18 therapeutic sessions) and again after 2 months of completion of the intervention. In between they were advised to practice at home. This completes the assessment process with pre-assessment (before intervention), post assessment (immediately after the intervention), and follow up assessment (two months after the intervention).

3.7.3. PHASE III: INTERVENTION

After the initial screening, as soon as the subjects were selected for the study, each one of them was given a brief idea about all the three kinds of therapeutic techniques

along with the conditions for control group. They were given the choice to select their treatment package. They were instructed in the following manner.

Instructions: "There are three treatment modalities available to you, '*Yoga Nidra*', Relaxation with Biofeedback and combination of *Yoga Nidra* with the Biofeedback. For treatment with *Yoga Nidra*, you have to lie down in *shavasana* and mentally follow the instructions given by the therapist. For relaxation with biofeedback, there is an instrument, which will give you feedback regarding your level of relaxation and you have to match accordingly and maintain the level. In case of *Yoga Nidra* with biofeedback, first you will relax with the help of bio-feedback and then therapist will assist you to perform *Yoga Nidra*. Of course, also for relaxation with biofeedback therapist will assist you to relax. All the three treatments are equally effective for essential hypertension cases. You may select the one which appeals you most".

Those who can not come for 18 sessions but were ready to volunteer themselves for the study were requested to come for three assessments and were studied as control cases. Once the subjects selected their status in the study. They were once again explained the following points.

For the Three Intervention Groups

- There will be three consecutive sessions at first, during which they have to under go several psychological assessment.
- Thereafter on every alternate day they have to come to the set up, for 18 therapeutic sessions.
- The investigator will assist them and they have to perform the exercise on their own.
- After completion of 18 sessions once again there will be three consecutive days sessions, during which they will be reassessed.
- Then after 2 months again they have to come for the follow up assessment for three consecutive days.

For Control Group

Subjects for control group are supposed to come for 3 consecutive days for the physiological and psychological assessments, which will be repeated twice in future. (Approximately after a gap of 2 months from each assessment).

3.8 CONDUCTION OF THE THERAPEUTIC SESSIONS

3.8.1 TRAINING ON *YOGA NIDRA*

Subjects those who were given training on *Yoga Nidra*, were first explained what *Yoga Nidra* is and about the different phases and duration of the *Yoga Nidra* session. The investigator demonstrated muscular relaxation by relaxing her own hand. Shavasana was also thoroughly explained. By making them lie down on Shavasana, the instructions on *Yoga Nidra* was given verbally by the investigator. They were requested to keep awake through out the practice. It is always desirable to keep awake and follow the instructions, though otherwise also the impact will not be less. So they need not be panic in case they fall asleep in between. Keeping awake will help them to practice at home when the investigator will not be there. It will reduce dependence upon the investigator (The instructions of *Yoga Nidra* is presented in Appendix - J.

3.8.2 TRAINING THROUGH BIOFEEDBACK ON ALPHA ENHANCEMENT

Subjects those who were given training on Alpha enhancement through biofeedback were first explained what biofeedback means, and how it works. They were made familiar with the instrument. The investigator demonstrated alpha sustention and then subject was helped to do so.

A Medicare bio-feedback - XL12 was used for the training purpose. Description of the instrument and technical details are presented in Appendix - K.

3.8.3 TRAINING ON COMBINATION OF *YOGA NIDRA* AND BIOFEEDBACK

Subjects of this group were oriented to both the techniques and then in the first half (i.e., for 10 to 15 min.) they were helped to sustain alpha waves. Thereafter in the second half of the session they were assisted to perform *Yoga Nidra*.

Subjects who were interested in undergoing the interventions were made to go through the screening procedure. Those who fulfilled the inclusion and exclusion criterion were included for the study. For each of the interventions, each subject was trained individually. If for some reason a subject dropped out of the study, he/she was replaced with another subject and the training started from beginning for the new subject. In all 25 subjects dropped out at initial stage of the study. The reasons given by them were either migration out of Baroda or lack of time.

3.9 STATISTICAL ANALYSIS

Nature of the collected data was quantitative, so it was desirable to carry out statistical analysis. The following statistical techniques were used:

i. Paired t test analysis for repeated measures.
ii. Multiple analysis of variance for repeated measures (MANOVA-RM).
iii. Analysis of covariance (ANCOVA) followed by Post Hoc Comparison by Tukey's HSD Procedure at 0.05 level.

These Statistical Techniques are described below:

3.9.1 PAIRED t-TEST ANALYSIS (REPEATED MEASURES)

When a variable is measured on several occasions for each subject, it is a repeated measures design. The simplest repeated measures design is one in which two measurements are obtained for each subject namely Pre and Post test scores. This type of

data is analyzed with a **Paired t-test.** It tests whether the mean of the first measure differs significantly from the mean of the second measure.

3.9.2 MULTIVARIATE ANALYSIS OF VARIANCE FOR REPEATED MEASURES (MANOVA-RM)

When we have more than two repeated measures namely Pre, Post and Follow-up of the dependent variable for each subject, we may ordinarily wish to perform paired t-tests for each pair of observations. However these multiple tests would not be statistically independent. In such cases, first we have to carry out the Multiple Analysis Of Variance for Repeated Measures (MANOVA-RM) to establish overall significance. If overall significance is established, we can perform a paired t-test for each pair of the measures. MANOVA is basically an extension of the Univariate analysis of variance to the case of multiple dependent variables and when the multiple dependent variables are the repeated measures it becomes MANOVA-RM. Average of the repeated measures can also be used in a Univariate analysis to test the significance.

There are a variety of statistics for evaluating the Multivariate differences. Four of the most commonly used tests are:

- Pillai's Trace
- Wilk's Lambda
- Hotelling's Trace
- Roy's Largest Root.

In the present study Pillai's trace has been used, as it is one of the most robust criterion. The significance level based on it is reasonably correct even when the assumptions are violated. This is important since a test that results in distorted significance levels in the presence of mild violations of homogeneity of covariance matrices or multivariate normality is of limited use (Olson, 1976).

The advantages of repeated measures are obvious. Besides requiring fewer experimental units (in the present study human subjects), they provide a control on their differences. The variability due to differences between subjects can be eliminated from the experimental error.

In the present study there are three repeated measures namely Pre, Post and Follow-up of each dependent variable for each subject. Data corresponding to each of these variables was first analyzed with MANOVA-RM. If found significant, each pair of the measures i.e., Pre-Post, Pre-Followup and Post-Followup for each dependent variable was further analyzed with the paired t-tests.

3.9.3 ANALYSIS OF COVARIANCE (ANCOVA)

Analysis of covariance represents an extension of the analysis of variance, where it is determined whether the differences in variance found in the dependent variable under two different experimental conditions exceed the differences to be expected by chance. Use of the same technique to include two or more variable is termed as analysis of covariance (ANCOVA).

Simple analysis of covariance must have a dependent variable, sometimes called criterion variable, that is measured at least on an interval scale. The independent variables can be all non-metric, or combinations of non-metric and metric variables. If an independent variable is considered as a categorical variable or treated as such even though each category may represent some metric value it will be referred to as a non-metric variable. In the analysis of variance, such non-metric independent variables are called factors. If one is interested in the possible effects of a single factor, the analysis is termed a one-way analysis of variance. If one is interested in the simultaneous effects of n factors, the analysis is referred to as an n-way analysis of variance.

If one is only interested in the effects of metric independent variables, the problem is basically that of multiple regression. However, if the user is interested in the effects of both non-metric and metric independent variables, the analysis is referred to as an

analysis of covariance. In such designs, the non-metric independent variables are usually called factors and the metric independent variables covariates.

Post Hoc Comparison By Tukey's HSD Procedure At 0.05 Level

When findings of ANCOVA supports the presence of differential impact of various treatments the null hypothesis is rejected in favour of the very broad alternative hypothesis that the three population means differed in some way. But where is the real difference (or differences)? All the different groups might differ from one another, or two of them might be equal and differ from the rest. To answer this question, after obtaining a significant overall F, one has to proceed with further statistical comparisons involving the group means.

The tests, which are used to make these specific comparisons are called post hoc comparisons or a posterior (Latin, meaning "what comes after") comparisons. They keep us from taking undue advantage of chance. Instead of using a sampling distribution that compares the means of only two samples (as is done with t-test), post hoc tests generally employ sampling distributions that compare the means of many samples. In short, post hoc tests protect from making too many type I errors by requiring a bigger difference (between sample means) before one can declare that difference to be statistically significant.

There are several commonly used post hoc tests. The only real difference among them is that some are more conservative than others. On ascending level of conservativeness with regard to type I errors (but descending power), one could choose from among such tests as Duncan's multiple-range test, the Newman-Kenls test, Tukey's HSD test, or the Scheffe's test. To use any one of these tests, F ratio must first be significant.

In the present study Tukey's HSD has been used. HSD stands for 'Honestly Significant Difference'. The test involves determining a critical HSD value for the data. Although the test can be used to make specific comparisons, most investigators make all pairwise comparisons. The hypothesis of equal population means is rejected for any pair

of samples for which the difference between means is as large as or larger than the critical HSD value.

The critical HSD value is determined by using the following formula:

$$HSD = q \sqrt{RSS / n}$$

Where RSS = the Residual Sum of Squares

n = the number of cases in each group.

q = the value of a new statistics called the studentized range statistics (based on sampling distributions comparing many means rather than two).

The value of q depends on the significance level (0.05 & 0.01), the number of samples to be compared, and degrees of freedom for the residue. To find q one has to refer to the studentized range statistic table (Source: Abridge from Table 29:E. Pearson and H Hartley, Biometrika Tables for Statisticians, Vol. I, 3rd ed., University Press, Cambridge, 1966).

The following chapter comprises of the results of the present study followed by discussion on each variable.