CHAPTER VI.
PRESENT STUDY.
CHAPTER VI.

Present Study:

1. Background. 460 - 470
2. The Design. 471 - 480
3. The Sample. 480 - 481
   (a) General: 481 - 483
   (b) Specific: 483 - 489
5. Description of the Apparatus/Materials used. 483 - 499
6. Procedures. 499 - 529
PRESENT STUDY

1. BACKGROUND:

With the increasing recognition of mental illness as a common cause of disability, interest in the utility of drug therapy has enhanced tremendously. There is great activity in this field for the potential benefit of humanity.

Pharmacological agents that exercise certain effects upon behavior have been known since antiquity. But intensive and systematic efforts so as to investigate the relations between drugs and behavior have only recently begun. A major factor contributing to the slowness of development of a science of behavioral pharmacology was the late recognition that behavior is a phenomenon amenable to study by the method of natural science (Thompson, et al. - 1970).

The rapid application of the tranquilizing and central nervous system stimulating drugs to the treatment of mental and other allied branches of medicine has far surpassed the rate of development of an experimental basis for their mechanism of action. Thus, there exists a greater knowledge of the effects of these drugs on the human organism than of the specific alterations of the nervous system (Truitt - 1958). The extensive use of these drugs and their unusual nature have stimulated many investigations into their basic pharmacologic mechanisms which now have begun to close...
this gap in our knowledge. But many areas of missing
information and contra-indication still exist (Truitt -
1958).

During recent years, however, there has been
a great expansion in the study of drugs which affect mood
and behavior. Many of these also have important effects
on central autonomic regulations (Goth - 1961). Many
factors have contributed to the great upsurge in interest in
psychopharmacologic agents. The findings that chemical com-
ounds such as LSD, Mescaline, and others can produce pro-
found changes of behavior and even hallucinations has focussed
attention on the possible chemical basis of disturbances in
behavior (Goth - 1961). More impressive was the findings,
as Goth mentioned, that certain central nervous system
depressants, such as Chlorpromazine, could influence abnor-
mal behavior at doses which did not produce sleep. This
finding suggested that a selective approach to influencing
mood and behavior was possible (Goth - 1961) in contrast with
the non-selective action of the barbiturates and other
hypnotics.

The hopes for selective influence were further
raised (Goth - 1961) when the rauwolfia alkaloids were found
to exert a tranquilizing action. There was great interest
in the demonstration that reserpine could alter not only
behavior but the concentration of serotonin and nor-epinephrine in the brain also. For the first time a relationship could be hypothesized (Goth - 1961) between behavior and the level of potent amines in the brain.

The interest aroused by these exciting discoveries was further reinforced when it was found that the mono-amine oxidase inhibitors exert behavioral effects in man and animals (Goth - 1961). These drugs also can influence the enzymatic destruction of certain amines in the brain with a resulting change in their concentration.

Underlying all this activity in research laboratories is a realization of the enormous importance of mental disease (Goth - 1961). It is hoped, at present, that tremendous amount of cooperative work on the biochemistry and pharmacology of the brain will benefit, as pointed out by Goth, the understanding and treatment of mental diseases. During the twentieth century the emphasis in the exploration of neural function has been on electrophysiological methods, but there are, it is now apparent, limits (Wyburn - 1960) to the usefulness of electrical techniques in the further elucidation of the intimate changes in the substance of the neuron of which nerve impulse is only one manifestation. Almost similar view has been opined by Brucke et al. (1970), while discussing the action of phenothiazine derivatives in
the brain stem reticular formation. To paraphrase: There is almost universal agreement that the "electrophysiologic" locus of action of the phenothiazine derivatives is in the brain stem reticular formation including the hypothalamus and the diffuse thalamic projection system. There is also an important direct influence of phenothiazine derivatives on the limbic system (Preston - 1956) which is anatomically, and functionally connected to the reticular system. The mechanism of action of phenothiazines on the reticular formation is, however, rather hypothetical. Many authors, including Terzian (1954) (as discussed by Brodie et al. - 1970) assume that these agents exert a direct effect on those mechanisms of the reticular formation which are responsible for the arousal reaction (e.g., Longo et al. - 1954; Hiebel et al. - 1954; Rinaldi and Himwich - 1955a; Dasgupta - 1962). Bradley (1963) modified this hypothesis, postulating that phenothiazine derivatives primarily block afferent impulses in the sensory collateral fibers to the brain stem. Killam (1962), on the basis of her own observations and the results of De Maar et al., (1958), believes that phenothiazines have no direct depressant effect on the reticular formation but facilitate inhibitory "filtering" mechanisms, thereby leading to a reduction of stimuli reaching the cortex. De Maar et al. (1958) expressed the view that the depressant
effect of phenothiazines on the arousal mechanism is effected through inhibition of long latency, slow conducting pathways in the reticular formation.

The large number of hypotheses on the "electrophysiological" mechanism of action of phenothiazine derivatives in brain may be confusing (Brucke et al. - 1970), but can be understood if one considers that most investigators have conducted their experiments only in one species and under special conditions. It is known that species differences greatly affect electrophysiological results. The multitude of hypotheses also demonstrates that it is impossible to characterize the mechanism of action of these agents on brain by electrophysiological experiments alone (Brucke et al. - 1970).

Thus, it is evident that, there is a necessity for the biochemical and pharmacological investigations of neural functions. Almost similar view has been propounded by Wyburn (1960) which may be summarized as follows: During the twentieth century the emphasis in the exploration of neural function has been on electrophysiological methods which have its limitations and hence, the next half of the twentieth century is likely to see an extension of the biochemical and pharmacological investigations of neural functions in spite of the fact that these (biochemical and pharmacological) have already yielded significant and meaningful contributions.
A rational approach to drug therapy of mental disease is intensive study of the biochemistry of human disorder (Kety - 1959). If characteristic metabolic abnormalities can be found in any disease then it may well become possible, in some cases to make drugs that will modify or even rectify them. This may offer great hope of therapeutic success in psychoses (Kety - 1959), in which behavior differs from normal in kind, rather than in the neuroses in which it differs mainly in amount. But if we are to use chemical findings as bases for the diagnosis, and treatment of patients suffering from mental illness, then there should be some basis for differentiating the neuroses from the normal condition, though the former differs from the latter only in amount. Similar type of limitations of biochemical approach have also been brought by Laurance (1966).

A therapeutic effect in human mental disease is hoped for (Laurance - 1966) if a chemical affects any part of the basis known to be related to behavior; if it interacts with substances known to occur in the central nervous system, such as adrenaline, 5-hydroxytryptamine and acetylcholine; if it antagonises substances which produce abnormal behavior, e.g., LSD; or if it modifies animal behavior in situations which resemble those known to induce fear or anxiety in man. However, this diversity of approach indicates how little is known of the pathology of mental disorder (Laurance - 1966).
Thus, once again, we see the difficulties in relying only on biochemical findings to date for the etiology, diagnosis and treatment of the patients in the field of mental illness.

The above mentioned limitations to the use of electrophysiological and biochemical findings for the diagnosis and treatment of mental patients, and also recent developments in chemotherapeutic approach to the problems of psychopathology (e.g., Winter et al. - 1956; Brady - 1957; Truitt - 1958; Ban - 1969; and Mahar - 1970) have stimulated renewed interest in laboratory testing methods for evaluating the behavioral and central nervous system effects of drug administration. This new approach may broadly be named as "Behavioral" analysis, which is of major concern to the present investigation.

The importance of behavioral analysis in the field of mental illness is manifold, some of the salient points may briefly be mentioned as follows:

After administration of a drug it is seen that clinically a reduction of anxiety, agitation and emotional lability in patients takes place which makes him more amenable to psychotherapy. But such treatment of mental disorders poses practical and theoretical problems for clinical psychologists working in this area (Winter - 1956). This is mainly because, though these drugs help in making disturbed
patients more manageable, reducing the need for restraints, sedative packs and seclusion, it is still undecided whether these reactions indicate that basic personality changes are being effected in the individual or whether the drugs only enable the patient to work out his problems more effecti-
vely by lessening the confusion and intense emotionality set off by unbearable conflict. Hence, the necessity to have a thorough understanding of the actions of drugs on the nervous system so as to know the exact nature and degree of therapeutic improvement or therapeutic efficacy of a partic-
cular drug. The necessity for this type of investigations has also been emphasised by several authors.

Thus, e.g., Truitt (1958) mentioned that, this type of investigation of certain drugs and their actions on the central nervous system which have been applied to the treatment of mental illness will attempt, where possible, to correlate and explain the observed clinical actions of these drugs with laboratory demonstrated mechanisms and thus to formulate some tentative hypotheses for their modes of action.

The usefulness of multiple approach (Butter - 1969) and the importance of "Behavioral" model (Maher - 1970) in the field of clinical psychology have already been discussed in previous chapters of this thesis, and hence, need not be repeated.
Ban (1969) pointed out that by investigating the effects of psychological medicines and the mechanisms by which they produce or counteract psychopathological phenomena, psychopharmacological research provides a method which not only extends the information of behavioral, psychophysiological, neurophysiological and neurochemical correlates of clinical symptoms but also is instrumental in directing attention to the functional pathology involved.

Clark (1970) mentioned that establishing a clinical entity entails isolating and defining its specific anatomic or physiologic features. In most mental diseases there are no known pathological lesions or biochemical changes which might be of etiological significance. Mental disease also differs from other diseases in several other respects. Mental disturbances are not associated with any easily elicited or objectively measurable physical signs. These disorders are primarily disturbances of behavior, mood and thought, manifesting themselves merely as exaggeration or disruption of these personality attributes and thus have to be diagnosed on the basis of altered mental processes and changes in behavior. A normal person, e.g., may at times display socially unacceptable behavior, become unduly depressed, or suffer disturbances of thinking. In this sense, symptoms of mental illness represent subjective evaluations
of the behavior of some individuals relative to the behavior of other individuals.

Demarcations between the different disease entities are blurred (Clark - 1970), and it is often difficult to differentiate one disease from the other. For example, it is not known whether the disturbances that we call schizophrenia or depression are unitary entities or a number of different disease states. This lack of knowledge makes the evaluation of psychotropic drugs/agents difficult.

With the advent of more precise methods for measuring behavior, there has developed an increasing experimental interest in the relations between behavior and other biological processes. By means of central nervous system lesions, electrical stimulation and recording, biochemical assay techniques (as already discussed in previous chapter of this thesis), knowledge of the relations between behavior and the internal functioning of living organism is steadily increases in scope. Drugs too, promise to add to the understanding of both behavior and the nervous system. A relatively sophisticated area of research, barely initiated as yet (Thompson et al. - 1970), is the investigation not simply of the effects of drugs upon behavior or upon the nervous system, but of the effects of drug activity upon known relations between behavior and the nervous system.
This approach will help us to know something about the biological basis of personality and also to have some idea as to why people respond differently to drugs. For example, we can infer, as Claridge (1970) pointed out that the mid-brain mechanisms controlling central excitation are probably especially active in introvert, anxious individuals compared with personality types who are more affected by sedative drugs; so that notion of nervous type. Almost a similar view has been propounded by Eysenck (1957) while discussing behavioral model in relation to the actions of drugs.

Behavioral approach in the field of psychiatric illness will help us to begin to specify which brain mechanisms may be disturbed in different types of patients (Claridge - 1970), as well as to throw light on the problem of how and why different types of treatments work.

Such being the background, the present investigation is an attempt to probe further into the several notions regarding the functioning of the brain in relation to behavior, or to put it in another way, the relation of drugs and behavior.
2. **The Design:**

The present investigation is an attempt to assess behavioral changes, mainly in terms of arousal (using different parameters of it), habituation and conditioning following drug administration vis., Chlorpromazine, Diasepam, and Imipramine to different diagnostic groups of psychiatric patients namely, schizophrenia, anxiety, and depression (endogenous). The pre-treatment condition of the behavior of each patient and each group of patients is taken as the basis for the evaluation of the actions of these drugs on the brain which reflect the temperament and behavior of the individual and in turn determines the capacity of the individual to respond to the environment.

The hypotheses involved in this investigation will be well understood on the basis of the following aspects which the present investigation aims to determine.

An area of the brain that has become of special interest to behavioral scientists (Claridge - 1970) over the past two decades is that which consists of grey cellular masses in the tegmentum of the medulla, pons and midbrain, running upwards from the lower brain stem to just below the cerebral cortex. Its importance in behavioral research is mainly because, it contains within it circuits that are very much essential to the brain's normal waking activities.
This area being a dense net work of nerve fibers forms several inter-connected functional systems. This part/area of the brain is known as brain stem reticular formation.

The complex psychological functions - consciousness is related to the activity of the brain stem reticular formation structures in human beings (Ban - 1969). These structures provide for the coordination of different levels of the CNS. For this reason the action of psychopharmacological substances on the brain stem reticular formation is one of the most extensively explored areas of research (Ban - 1969; and Claridge - 1970), and hence, its importance in the present investigation.

From the point of view of its function, reticular formation may be broadly classified into - Ascending and Descending parts. Whereas the Descending reticular system is a part of the extra-pyramidal system (Ban - 1969), the Ascending reticular system is considered to be a part of the sensory pathways of the CNS. That part lying within the mid brain itself has been called the Ascending Reticular Activating System (A.R.A.S.) (Claridge - 1970). The impulse from an environmental stimulus is transmitted in part through the lemniscal system to a localized area in the cortex and in part through the side branches of the
reticular system diffusely to the whole system. Both indirect environmental stimulation and direct stimulation of the brain stem reticular formation by implanted electrodes produce an electroencephalographic arousal reaction, seen on the surface electroencephalogram, desynchronized activity of low amplitude and fast rhythm, the opposite of that occurred in deep sleep (Details discussed in chapter one of this thesis). Continuous stream of impulses passes upwards from the ARAS to the cortex, toning it up and preparing it to respond to environmental stimuli. It is partly from here that variations along the behavioral sleep-wake continuum originate; the changes in GSR and other peripheral responses being external signs of that what is happening in the brain (Claridge - 1970). Thus, following Claridge (1970) it has been hypothesized that ARAS would be the suitable area of the brain for the purpose of the present investigation.

Not only may a sleeping animal be aroused by sensory stimulation or direct electrical stimulation of this system, but also a waking organism may be alerted to a higher degree of attention (Sheer - 1961). Another possible function is to facilitate the transmission, elaboration and integration of messages arriving at the cortex over the primary or specific sensory pathways. In order to perceive and act
upon stimuli in the environment in a discriminatory way, based on past experience, a functional reticular activating system seems to be necessary (Sheets - 1961).

The importance of this area has also been stressed by others, e.g., Samuels (1959) who pointed out that, the brain stem reticular formation is organized in a much more discrete manner as far as its descending effects are concerned than it is for the performance of its ascending functions. In this, in contrast with the thalamic reticular system, which is more specific in its cephalic effects, and less so in its caudally directed ones. Since in brain research the primary concern is with individual differences, it is better to direct attention to neurophysiological mechanisms which have relatively global effect on behavior (Grey - 1964). As the present investigation aims to investigate the effects of drugs on the reticular formation and more so on the ascending part of it, using psychophysiological measures, we are following the lead given by a number of other workers (Lindsley - 1951, 1957; Hebb - 1955; Malm - 1959; Berlyne - 1960; Grey - 1964; Ban - 1969; and Claridge - 1970).

In animals the activating properties of the ARAS can be demonstrated by stimulating it directly through electrodes implanted in the mid brain. The sleeping animal
stimulated in this way will immediately be waken and become behaviorally more active (Claridge - 1970). Above the ARAS is a second circuit called the diffuse thalamic projection system. This is situated in the diencephalon, or "between - brain", so called because it falls between the mid-brain or mesencephalon, and the cerebral hemispheres. This thalamic system also activates the cortex but does so more selectively and that too for a briefer period of time than the ARAS (Claridge - 1970). One of its functions is believed to be that of helping the brain to shift and focus its attention, thus probably providing the physiological basis of the attention - span changes. Both the thalamic and mid-brain systems some times known collectively as meso-diencephalic system — come under the control of the cerebral cortex, which can either excite or suppress their activity (Claridge - 1970). In addition to this, each has its own in-built excitatory and inhibitory circuits. (The excitating and inhibitory functions of the brain have been discussed in detail in chapter one of this thesis). However, those writers (Lindsley - 1951, 1957; Hebb - 1955; Malmo - 1959; Berlyne - 1960; Grey - 1964; Ban - 1969; and Claridge - 1970) who have attempted to utilize the knowledge of the reticular formation's functions in connection with the behavior theory of arousal, have mostly stressed the generalized
activation properties possessed in particular by the brain stem reticular formation. However, a detailed description of the importance of the reticular formation in relation to arousal, habituation and conditioning is already mentioned in chapter one of this thesis and need not be repeated. The principal measures of the functions of the reticular formation taken in the present study are arousal, habituation and conditioning.

Coming to the third aspect of this thesis, it may be pointed out that, perhaps it is needless to enter into the considerable volume of evidence which makes it obvious that drugs which exert an arousing or tranquilizing effect on the organism are likely to have a reticular site of action (Sheet - 1961; Killam - 1962; Grey - 1964; Ban - 1969; and Claridge - 1970).

Psychological drugs, however, were recognized to have a differential effect on the arousal reaction, which is intimately related to the functions of the brain stem reticular formation (Ban - 1969). Among the various psychological drugs it was found that sedative barbiturates have a particularly strong depressant effect on the brain stem reticular activating system. It was shown that they produce an increased threshold (Ban - 1969) to direct electrical stimulation in these structures and depressed evoked potentials to a variety of peripheral sensory stimuli.
In contrast to sedatives, Bradley and Key (1958) demonstrated that stimulant amphetamine lower the electroencephalographic and behavioral thresholds for arousal. This applies to both environmental and direct stimulation, which means that, besides lowering the threshold of sensory impulses, amphetamines also have a direct stimulating action on the brain-stem (Ban - 1969). However, a detailed description of the modes of actions of the drugs selected for the present study is given in the chapter four of this thesis and hence, need not be repeated here.

Coming to the last aspect which the present study aims to determine, i.e., indices for the measurement of the functions of the reticular formation, it is found as Irwis (1966) pointed out that, since observable effects of drugs are the results of a complex drug-tissue-individual-environment interaction, they may be best understood by the functions of the CNS activity, which reflect the temperament and behavior of the organism and determine its capacity to respond. Thus, he directs attention to observations on changes in psychomotor (arousal, wakefulness, activity, response to stimuli, memory, learning, biological drives), neurological (posture, muscle tone, equilibrium, gait, reflexes, CNS excitation) and autonomic (body temperature), sympathetic and parasympathetic functions. Furthermore, for psychopharmacological purposes he considers the assessment
of behavioral arousal as most important of many variables involved (Irwi - 1966). In the present investigation also, behavioral arousal has been taken as one of the variables.

For the assessment of arousal different measures may be used. In the present investigation G.S.R., reaction time, two-flash-threshold, sedation threshold, etc., have been used as these phenomena indicate both the functions and strength of the nervous system (Grey - 1964), and also have shown to be affected by stimulation of the reticular formation (Eysenck - 1963; Sheer - 1961; Grey - 1964; and Claridge - 1967, 1970).

The measures of 'Satiation' (Kohler and Wallach - 1949; Klein and Kretch - 1952) and 'Time Estimation' (Sheer - 1961) being considered as indicative of one's cortical conductivity (Kohler and Wallach - 1949; Klein and Kretch - 1952) and also affected by the functions of the reticular formation, especially its activating system (Sheer - 1961), in the present investigation, measures of verbal, perceptual, and kinesthetic aspects of satiation as well as time estimation capacity of the subject are taken into consideration.

In addition to this, it has been suggested (Ben - 1969) that 'Conditioning' studies in human pharmacological experiments may be useful not only for empirical prediction but also for the prediction of a higher level on which a
particular pathological attention is counteracted with a sub-
stance having a particular effect. In human pharmacological
studies — with the frame of reference of the classical condi-
tioning paradigm — the autonomic and motor components of
various OR phenomena, such as the extinction of the OR; OR
formation, CS generalisation and differentiation, are most
frequently employed (Ban - 1969). The autonomic components
are usually studied by measuring the galvanic skin reflex
(GSR) or vascular reactions (plethysmography), while the
motor components are often studied by, Electroencephalography
(EEG), Eyelid closure or by finger withdrawal technique (Ban
- 1969). The other autonomic and peripheral measures: which
are associated with one's arousal and activation are blood
pressure, heart rate, muscle tension, etc.,. In the pre-
sent investigation, finger plethysmography has been used to
assess the rate of habituation, and Pavlovian (Classical)
conditioning technique for the purpose of measuring rate of
adaptation, conditioning and extinction.

To put concisely, the reticular activating sys-
tem forms the locus of attention in the present investigation,
and the drugs selected also have their effects on that parti-
cular part of the brain. To assess the actions of these
drugs, on various behavioral phenomena like arousal,
habituation and conditioning various psychophysiological measures like GSR., etc. are taken into consideration. Various indices are selected for both subjective and objective evaluations of changes in behavior in both the pre and post treatment phases.

3. THE SAMPLE:

A total number of seventy patients depending upon the criteria mentioned below has been taken for the present investigation. The sample consisted of patients attending psychiatric out-patient and special clinics at the Government Mental Hospital, Bangalore. The sample comprised of three groups — Anxiety, Schizophrenia, and Endogenous Depression.

(a) Anxiety:

Thirty patients (16 males and 14 females) diagnosed as cases of anxiety state were selected. Their mean age was 24.66 years; S.E. was 0.743. The duration of illness ranged from three months to seven months.

(b) Schizophrenia:

The group consisted of thirty patients (13 males and 17 females) diagnosed as cases of Schizophrenia (unclassified/undifferentiated). Their mean age was 22.966 years;
s.E. was 0.662; the duration of illness ranged from fifteen days to two months.

(c) **Endogenous Depression:**

The group comprised of ten patients (8 males and 2 females) with mean age of 34.900 years; S.E. was 2.244; and the duration of illness ranged from four months to ten months.

4. **CRITERIA FOR THE SELECTION OF SAMPLES:**

(a) **General:**

(i) Those patients diagnosed as cases of Anxiety, Schizophrenia and Endogenous Depression (as the case may be) by the Chief Psychiatrist attending the out-patient or Special clinics at the Government Mental Hospital, Bangalore were taken for this investigation.

(ii) For all these patients it was first attack, onset was acute and they were not on any drugs (physical or psychological) or any other type of treatment before consultation and were not admitted to the hospital.

(iii) An attempt was made to restrict the age range of the patients so as to avoid certain complications which might have arisen (beyond that age limit) during the investigation.
(iv) All patients were literate, the range of their education being Secondary School Leaving Certificate (S.S.L.C.) to graduation (this was mainly because patients could communicate in English).

(v) Thorough physical and neurological examination did not reveal any organic pathology in the case, nor any serious physical ailment involving any one of the systems like, Cardiovascular, Respiratory, Gastrointestinal, etc. This was to avoid any serious danger to the patient's life during the investigation.

(vi) Only those patients who could be kept without medication for three days (with permission from the chief psychiatrist) without seriously aggravating illness or posing a risk to the patient's life.

(vii) Those who were thought to be cooperative and willing to undertake laboratory tests (including Sedation Threshold Test) and who had agreed to come for follow-up and to undertake all the tests during post-treatment phase after specific period of time.

(viii) Alcoholics and other addicts were excluded.
(b) **Specific:**

(i) After being diagnosed as case of anxiety, schizophrenia or endogenous depression by the chief psychiatrist only those patients were selected who had significant scores on the Max Hamilton's Anxiety Rating Scale, Wittenborn's Psychiatric Rating Scale, and Max Hamilton's Depression Rating Scale respectively, as was rated by another psychiatrist.

(ii) The patients who were finally selected also had high loading on the anxiety scale, the schizophrenia scale and the depression scale (in case of anxiety, schizophrenia and depressive patients respectively), as was revealed by through Multi-phasic questionnaire (M.P.Q.), which was administered by the investigator.

5. **DESCRIPTION OF THE APPARATUS/MATERIALS USED:**

1) **Multiphasic Questionnaire (M.P.Q.) :-**

Multiphasic Questionnaire (MPQ) has been constructed on the lines of M.M.P.I. and was developed and standardized on Indian population by Murthy (1964, 1965) and later by Murthy and Lakshminarayan (1968). This clinically useful tool has been able to determine the nature of loading
of clinically identifiable syndrome like hysteria, anxiety state, mania, depressive, paranoid and schizophrenic psychosis. For the validation of this tool the population consisted of 49 paranoid cases, 30 depressives, 30 manics and 33 anxiety states. The normal population with whom the above groups were compared consisted of 111 normals. The groups were comparable with the normal population for age, sex, & education. The Chi-Square Test was employed to determine the significance of difference for each item between the normal and the clinical group and it was found that the items which differentiate each of the clinical groups from the normals were significant at 0.01 level or at a more (significant level). This tool consists of 100 statements and for each statement only two types of answers are provided, i.e., true (T) or false (F). For each scale a "Cutting Score" has been established which indicates the level at which or above which the score can be taken as significant. Thus "schizophrenic" scale 20, significant items are given: for "paranoid" scale 18, for "manic" scale 16, for "depressive" scale 14, for "anxiety" scale 26, and for "hystera" 8, items. The cutting scores for each of these scales are 5, 7, 5, 5, 11, and 4, respectively. The questionnaire has been used in this study for substantiating the clinical diagnosis. All the scales are given in Appendix - . . .
2) **Wittenborn's Rating Scale**

Wittenborn (1957) has constructed fifty-five symptom rating scales. "The set of rating scale is considered to comprise a good sample of the descriptive aspects of mental hospital patient's behavior currently considered by psychiatrists to be important in evaluating patients and in making diagnosis. Each rating scale describes only one extreme of a pathological manifestation. The scales are in such a form that they may be checked for every patient in order to reduce bias on the part of the raters, the scales being presented in a randomized, unlabelled manner. In order to minimize systematic differences between raters, due to their theoretical - orientation the scales are primarily descriptive and involve as little interpretation as possible" (Wittenborn - 1957).

These scales have been applied to many different groups of patients and several factor analytic studies have been carried out. Nine clusters or factors emerge from these analyses, namely - (1) Conversion Hysteria; (2) Manic State; (3) Acute Anxiety; (4) Depressed States; (5) Schizophrenic Excitement; (6) Paranoid Condition; (7) Paranoid Schizophrenia; (8) Hebephrenic Schizophrenia; and (9) Phobic compulsive.

Each of the symptom rating scale comprises four
items (in a few cases only three). In the case of no scale is item Level 1, given a scoring value. For those scales given a weight of one, a check at item Level 2, contributes one point to the total score for the cluster in question; a check of item Level 3, contributes two points, and a check at item Level 4, contributes three points. In the case of scales which receive a weight of two, a check at item Level 2, contributes two points to the clustering score in question; a check at Level 3, contributes four points, and a check at Level 4, contributes six points. The sum of the weighted item level scores for the scales contributing to a given cluster comprises the raw cluster score, the raw cluster score is given a standard meaning by transmitting it to a standard scale of 10 points. This scale has been used on Indian population (Vinutha - 1969). This is given in Appendix. B...).

3) Max Hamilton's Anxiety Rating Scale:

The scale was designed by Max Hamilton (1959). It is intended for use with patients already diagnosed as suffering from neurotic anxiety, not for assessing anxiety in patients suffering from other disorders.

There are in all thirteen variables (see appendix C.)
in this scale to assess anxiety including behavior of the patient at the time of interview. These are: Anxious mood, tension, fears, insomnia, changes in cognitive functions, depressed mood, general somatic, and muscular symptoms, cardiovascular symptoms, respiratory symptoms, gastro-intestinal symptoms, genito-urinary symptoms, autonomic symptoms, and general behavior during interview (general and physiological symptoms like, tense, tremor, swelling, sweating, etc).

Assessments are made on a five-point scale depending upon the subjective report of the patient. Grades are: 
0 = completely absence; 1 = mild; 2 = moderate; 3 = severe; 4 = very severe; 5 = greatly disabling. Its mean inter-rater reliability was .89. This scale has been used on Indian population (Upadhyaya - 1972). The scale is given in appendix C.

4) Max Hamilton's Depression Rating Scale

This scale has been devised by Max Hamilton (1960) for use only on patients already diagnosed as suffering from affective disorder of depressive type. It is used for quantifying the results of an interview, and its value depends upon entirely on the skill of the interviewer in eliciting the necessary information (Hamilton - 1960).
The scale contains 17 variables. Some are defined in terms of a series of categories of increasing intensity, while others are defined by a number of equal-valued items. The original form on which ratings are recorded also includes four additional variables. Diurnal variation, derealisation, paranoid symptoms, obsessional symptoms. These are excluded from the scale because the first is not a measure of depression, (as pointed out by Hamilton) or of its intensity, but defines the types of depression. The other three occur so frequently that there is no point in including them (Hamilton - 1960). Mention may be made here that, all the 21 variables have been used on Indian population (Ansari - 1968) and those four variables were found important.

The variables are measured either on five-point or three-point scales, the latter being used where quantification of the variable is either difficult or impossible. No distinction is made between intensity and frequency of symptoms, the rater having to give due weight to both of them in making his judgement.

Gradings: 0 = Absent; 1 = Mild; 2 = Moderate; and 3 = Severe. 0 = Absent; ·1 = slight or doubtful; and 2 = clearly present.

Various problems are to be found with specific
symptoms (Hamilton - 1960). The considerable difficulty is found with the depressive triad; depressive mood, guilt, and suicidal tendencies. These are so closely linked in description and judgement as to be very difficult to separate. It is very important to avoid, the halo effect by automatically giving all of them high or low scores, as the case may be.

However, the scale has undergone a number of changes (Hamilton - 1960). Since it was first tried out, and although there is room for further improvement, it is found efficient and simple in use. It has been found to be of great practical value in assessing results of treatment. It has been used on Indian population also (Ansari - 1968). This scale is given in Appendix - ..P....

5) Wolff's Behavior Rating Scale :-

This scale was designed (Wolff - 1961) to evaluate the effect of post-discharge planning and follow-up on the post hospital adjustment of mental patients. There are fifteen different scales (see Appendix - ..G...), each one showing one way in which a person can be observed. Each scale runs from one extreme to the other, from "bad" to "good", from "abnormal" to "normal". The rater is to place a mark in
in the right place where he feels the patient can be rated on that particular scale during his observation (rater's observation). On each of the fifteen different scales the rater can have extreme possible total score within a range of 1.0 to 5.0.

The scale has face validity. In addition, the scale was shown to have a satisfactory level of validity as judged by outside criteria. An item analysis was done to determine to what extent each of the scales contributes to the total score (the average of scale scores). It was found that all scales contribute about equally to the total score. The range of correlation co-efficients runs from .66 (Scale XIV) to .88 (Scale VI) with an average of .78. It appears that there must be pattern of close inter-correlations between all scales.

Thus, this scale helps to assess the patients behavior and performance in the hospital. It provides an easy-to-use, fairly objective and reliable method of recording the observed behavior of patients in a rehabilitation therapy setting. It appears to be sensitive enough to differentiate between patients and describe changes in a patient over a period of time. It has been found to be useful in providing a quantifiable description of patients in a research study (Wolff - 1961), and is quite expected to be useful also as an aid in the clinical evaluation of patients. This scale is given in Appendix - .
GSR was measured using a Psychogalvanoscope. The Psychogalvanoscope used in the present study (designed by the Anand Agencies, Poona, India) is a modified form of an earlier model designed around 1930 by Dr. Howell. As the Psychogalvanoscope may be roughly described as an electronic resistance measuring device, several special features are incorporated in its circuit and design which facilitate its practical application. (A bridge circuit is employed to balance the resistance across the electrodes). Small changes in resistance appearing between electrodes are amplified by several stages of vacuum tubes to indicate these changes quantitatively. In addition, it has a power switch, sensitivity control, manual zero, and automatic zero knobs, coarse pointer centering knob, knob for finer adjustment, tip jacks for inserting the electrodes tips and meter pointer centering knob.

It is a D.C. amplifier. The amplifier is designed to operate only when plugged into a power supply of 115 volts, 60 cycles. The amplifier can be calibrated by shunting a known resistance across the electrode terminal.

The primary accessory of the Psychogalvanoscope is the electrodes. The electrodes used in the present study were constructed as suggested by Venables and Martin (1967).
Discs of 2 cms. diameter and 1 mm. thickness were cut from pure silver sheet. The discs were washed in 2 N NaCl and distilled water to remove any trace of iron left during cutting process. After drying the silver discs, 16 S.W.G. tinned copper leads were soldered to the centre of each disc. Rubber ring was attached to the periphery of each disc. The back side of each disc was filled with araldite. Using fresh KCl solution the electrodes were chlorided by making them the anodes and a piece of pure silver, the cathode. A current of 0.5 mA was passed through it for certain period of time till the electrode's surface became greyish. The electrodes were washed in distilled water and placed in KCl solution for washing again for a day.

Polygraph jelly was used as electrode jelly.

The position of the subject while taking GSR is shown in the picture.

7) **Spiral After Effect Test** :-

A model of Archimedes Spiral, devised by All India Institute of Mental Health (Psychology Laboratory), Bangalore, was used. The spiral was painted on a metal disc (of 8 inches diameter) with black and white paint. It was
mounted on a phonograph turn table which could be rotated electrically at a fixed rate of speed and reversed by a switching arrangement. The speed of rotation of the spiral was 120 revolutions per minute (in case of both clockwise and counter clockwise directions). The disc was rotated by a constant speed motor. The positions of the spiral and the subject are shown in the picture.

8) **Verbal Satiation**:

The following five words were used so as to produce verbal satiation -- Child, Me, Rich, Family, and Truth. The words were arranged in 30 pre-determined random order (following standard table for randomisation; William et al. - 1956) and each subject was arbitrarily assigned to one of these orders. This was done so as to avoid repetition of the same order of presentation. The subject was required to rate each word on a nine 7-point semantic differential scales taken from Osgood, Suoi, and Tannerbaum (1953). Each scale was a mimeographed line having 7 divisions and appropriate levels like, good - bad; beautiful - ugly, etc (see appendix\textsuperscript{\textregistered}) at the two ends of the scale. Three scales for each of the three Semantic factors of Evaluation (E), Potency (P), and Activity (A) were provided for rating (see appendix\textsuperscript{\textregistered}).
The scales were presented in a fixed order to all the subjects before and after satiation in each of the pre- and post-drug treatment experimental conditions. The position of the subject while doing this experiment is shown in the picture.

9) Habituation :-

For this experiment a Photo-electric Plethysmograph Model MPP - 2 was used. This model was used with a D.C. amplifier connected to a Galvanometer to record changes in them in pulse waves. The model MPP - 2 has got a light source (Mini-lamp, 3 volts.), detector (sulfureted cadmium cell) and power supply (2.5 volts. nickel - cadmium dry battery, with built in charging device for 100 volts. A.C.). The output of the detector at the tip of the finger was approximately 5 mV and this could be used continuously without recharging approximately for 6 hours. A light shielding strap was necessary while fixing the detector at the finger tip of the subject, so as to avoid the interference of any external fluorescent lamp in its recording. Using a pair of ear phones white noise was produced as an external stimulus and for this a sound producing transistor was constructed by the Department of Psychology, All India Institute of Mental Health, Bangalore.

The experimental set up is shown in the picture.
10) **Reaction time:**

For measuring reaction time (RT) an apparatus (automatic system) well equipped with different switching and control arrangements was devised by the Department of Psychology, All India Institute of Mental Health. The arrangement was so made that it was possible to present the stimulus, either red light or white light (as the case may be) with or without a warning signal which might be either visual or auditory and also varying the durations of warning signal, stimulus time and inter-periods, just by manipulating its controlling arrangements. There were two keys for the subject, depending upon the design of the experiment, the subject's task was to use either one or both. There was also an arrangement if necessary, to produce white noise, which the subject could hear through a pair of earphones (this was used in the present experiment) so as to create distraction or interference in the task and thus to increase its complexity. Reaction time was recorded using chronoscope which was connected electrically with the subject's key.

The experimental set up is shown in the picture.

11) **Time Perception:**

A buzzer which served as the standard, and two telegraph keys, one for the subject and one for the experimenter were used in this experiment. Both the keys were
connected with the buzzer via a chronoscope in such a way that whenever the subject or the experimenter (as the case may be) pressed their respective key, the buzzer used to produced sound and the duration of the sound (produced by the buzzer) was recorded on the chronoscope. The electrical connection was so made that only when the subject or the experimenter pressed the key, the chronoscope used to work. The chronoscope was also having an arrangement which could be used to bring the needle at the zero point (re-setting).

The position of the subject during the experiment is shown in the picture.

12) **Two-flash-Threshold:**

For this experiment an apparatus was devised by the Department of Psychology, All India Institute of Mental Health, Bangalore. It was a wooden Square box, painted on all the four sides with black color, having a transparent glass plate at the centre through which the flashes of light were visible. This was connected with an electronic devise known as stimulus controller. The controller was controlling the time length of two electrically operated stimuli. For the present purpose, a new switch board was constructed. The switch board was connected with the stimulus controller and was so made that the length of the time interval could
be varied up to 130 msec. Just by controlling the switching arrangements. This was operated electrically using step-down transformer 220 V.

Apart from this, a pair of earphones constructed by the Department of Psychology with appropriate transistor was used.

The positions of the instruments and the subject are shown in the picture.

13) **Kinesthetic Figural After-Effect**

The apparatus used in this experiment was an adaptation of the described by Klein and Krech (1953). The testing apparatus consisted of a "Standard Test Object", a "Stimulus Object", a "Comparison Scale", and stands and tables upon which these various objects were mounted. The Standard Test Object was a block of unpainted, smooth hard wood, six inches in length, one and one-half inches in breadth, and one inch deep. The Stimulus Object was made of the same wood but with corresponding dimensions of six inches by two and one-half inches by one inch. The Comparison Scale was a wooden block (similar to the other objects) which tapered in width from a half inch at the narrow end to four inches at the wide end. The scale was thirty inches
long and one inch deep. Scale readings were calibrated to one thirty-second of an inch. The scale was permanently fixed on a mount while the Standard Test Object and Stimulus Object could easily be inserted into the second mount. To aid accuracy in measurement all three objects were equipped with a sliding "rider" which fixed the position of thumb and forefinger as the subject held the sides of the objects. The apparatus was so arranged as to present the Comparison Scale to the left of the seated subject, the Test and Stimulus Object (as the case may be) to the right of the subject. The positions of the apparatus and the subject are shown in the picture.

14) **GSR Conditioning**

For GSR conditioning a Psychogalvanoscope (described earlier), a sound (white noise) producing transistor (audiogenerator) and an inductorium to produce shock were used. The sound producing transistor was constructed by the Department of Psychology, All India Institute of Mental Health. A pair of earphones was used through which the white noise (conditioned stimulus) of medium intensity was presented to the subject. The unconditioned stimulus was electric shock which was delivered to the subject through the inductorium via electrodes fixing with the help of adhesive tapes on the right leg of the subject.
The exact positions of the apparatus and the subject are shown in the picture.

15) Sedation-Threshold:

The materials required for this experiment were electric tape recorder (‘National’ Model RQ - 1945 - 4 track) along with its accessories; Thiopentone sodium; 20.0 c.c. syringe and needle; steriliser set and other accessories; sphygmomanometer, etc.

For providing adequate facilities for resuscitation the following materials were kept ready:

- Oxygen cylinder and rubber tubes.
- Resuscitator set.
- Artificial respirator.
- Laryngoscope, spanner; and drugs like coramine, Adrenaline, etc.

The position of the subject along with the necessary equipments are shown in the picture.

6. PROCEmURE:

After the selection of the patient on the basis of the criteria mentioned earlier and before starting any laboratory investigation as such, further attempt was made
to establish rapport with the patient explaining to him/her the importance of such investigation and also to make him/her feel free from any sort of pre-formed apprehension about the psychological investigations which he/she was supposed to undertake. At this stage, during conversation, the patient or the relative of the patient (as the case may be) was asked certain questions taken from Behavior Rating Scale (Wolff - 1961) and was rated by the experimenter so as to have an idea about the nature or level of social adjustment and general behavior of the patient to the environment where he/she was staying during the treatment period. Following this, the laboratory investigations were started.

All the different types of experiments conducted in the present investigation were administered to each subject on several sessions in successive three days, of which the last session was completely meant for the Sedation Threshold experiment which was always conducted during morning hours on the last day of the experiment.

In between two sessions, and in between two experiments in each session, rest was provided for a certain while which was thought to be sufficient enough for the patient to overcome the fatigue effect, if any, during the investigation.
Various sessions for the test/experiments were conducted during the same period of the day for all the patients.

For brevity of explanation however, the whole investigation may be divided into the following ten parts depending upon the nature of the experiments involved. In the first session, experiment number 1, 2A, 2B, 3, 4, and 5 (explained below), in the second session, experiment number 6, 7A, 7B, 8, and 9, and in the third session, only the experiment number 10 were conducted and the same order was maintained for all the patients of three different diagnostic groups and in both the phases of pre and post-treatment experimental investigations.

**Experiment No. = 1:**

**GSR:**

This experiment was conducted at first (before administering any other test) so as to have an idea about the subjects' Basal/Initial GSR value/level as measured by the Psychogalvanoscope, described earlier.

The room in which this experiment was conducted was having proper ventilation and moderate illumination necessary for this type of experiment and also was free from any
external disturbances. Venables (1955) reported the significant relationship between skin response and humidity, where humidity would be beyond certain percentage. In the present investigation, readings show that the temperature of the room was more or less constant with 70°F, change noted was only about 5°F between all the individuals testing and humidity being 50 per cent which was below Venables report of humidity affecting the skin response.

After the subject was acquainted with the experimenter as well as the room where this experiment was conducted, a brief description of the nature of this experiment was given to him/her. Then he/she was asked to remove shoes and socks and to wash his/her palms cleanly with carbolic soap and dry properly with a clean towel provided to him/her. After this, the subject was asked to lie down on a comfortable bed and relax properly keeping his/her hands and legs stretched fully and eyes closed. At this stage, the psychogalvanoscope was switched on (which was kept behind a screen) so as to allow it to get warmed up sufficiently. Following this, the two electrodes (described earlier) with jelly (mentioned earlier) were fixed on both the palms of the subject and the subject was asked to press the electrodes with his/her finger so that the contact pressure (and hence the amount of current permitted to flow) was relatively constant
PASAL/INITIAL LEVEL OF AROUSAL.
as it was found by some previous workers in this field (Howe - 1958; Thimmappa - 1969). Electrodes were fixed with adhesive tapes and were-connected with the tip jacks in the psycho-galvanoscope. At this state, when the subject was relaxing, the experimenter went behind the screen and started manipulating the meter pointer centering knob (also knobs meant for coarse and finer adjustments) so as to bring the needle of psychogalvanoscope to the zero point (or nearing zero) and kept it in that position. After about twenty minutes period of time (time was recorded on an electrically operated watch), Basal/Initial reading was noted from psychogalvanoscope. In all, ten readings were taken (as it may not be expected for any subject that the needle will not show any deflection continuously for a certain period of time) at an interval of ten seconds and the mean of these ten readings was taken as the (Basal) score. The mean basal score obtained for each subject was converted or transformed into resistance and then was converted into ohms for conductance.

Experiment No. 2(A); PERCEPTUAL SATIATION:

In this experiment, using Archimedes Spiral (described earlier), an attempt was made to produce a situation which has been termed as "Perceptual Satiation" in the present experiment. Procedure to induce this perceptual satiation was as follows.
The subject was asked to sit approximately 8 feet away from the apparatus on a chair in the laboratory with proper illumination. The rotation of the spiral was always in clockwise direction, the interval between successive trials varying with the duration of the reported after-effect by the subject. Each trial was for 30 seconds duration (stimulus presented). Instructions given to the subject were essentially the same as those used by Price and Deabler (1955), with slight modification because of the novelty adapted and little addition so as to suit the purpose of the present experiment.

The following instructions were given by the experimenter:

"As soon as the experimenter says - 'ready', please look at the centre of the spiral and do not shift or take your eyes away until you are asked to do so. When you will be looking at the centre, the spiral will rotate for a certain while and after that it will stop. When it stops, please continue to look at the centre, and report to the examiner that you see there." On enquiry, during practice trial, subjects used to express their experience using different terms, like, it is "expanding", becoming "bigger", "coming out", etc. Depending upon the word used by the subject, he/she was told again, "do not shift your
PERCEPTUAL SATIATION
eyes and tell the examiner 'stop' when you see the spiral 'becoming bigger' or 'expanding' or 'coming out' (as the case may be) has also stopped." As soon as the subject used to say stop, immediately after that the spiral was switched on for a period of 30 second duration. In this was, ten trials were given. The durations of the after-effect as reported by the subject for successive ten trials were recorded separately using a stop-watch. The average of ten trials was taken as the final score of the subject in this experiment.

Experiment No. = 2(B) : PERCEPTUAL SATIATION:

The procedure adapted and the instructions given to the subjects were essentially the same as in experiment 2(A). Only novelty adapted here was that the spiral was always rotated in counter clockwise direction. On enquiry during trial, when the subject used to express his/her impression using words like 'going in', 'becoming smaller', 'contracting', in subsequent instructions also those words were used to make it easily understandable to the subject.

Experiment No. = 3 : VERBAL SATIATION :

For this experiment, the Semantic Differential (S.D.) Scales (Osgood, C. - 1953; also Kerlinger - 1964),
were used to induce in the subject a condition which has been called as "Verbal Satiation" in the present experiment. The procedure followed for this was essentially the same as used by Das (1964) which can be described as follows:

The subject was asked to sit comfortably on a chair facing the experimenter in front of a table. What the subject was expected to do in this experiment was explained to him/her and was provided with a pencil and rating scales as the materials needed for this experiment. Each of the stimulus word (mentioned earlier) was printed on a white card (all the cards were of equal size, shape, colour and contained letters of the same size) separately and was presented in front of the subject one after the other according to its pre-formed random arrangement (described earlier).

Following the initial presentation ratings of the stimulus words, the subject was asked, after a certain time gap (mentioned below), to repeat the word that the experimenter would expose as quickly as possible until the experimenter said "stop". The number of repetitions for the first fifteen seconds was recorded by the experimenter in order to see that the rate of repetition was at least two per second. If the rate of repetition was less than two per second, the subject was asked to repeat the word still faster until that criterion was reached. The timing used for the experimental
VERBAL SATIATION
procedure was as follows:

(i) A one minute interval between pre-satiation rating and repetition of the first stimulus words for satiation.

(ii) A five seconds exposure of any stimulus card before repetition started.

(iii) Immediate rating of the word followed by a 40 second repetition.

(iv) A 30 seconds interval between the end of rating of a stimulus word after repetition for 40 seconds and beginning of the satiation procedure for the next word.

Rating on the nine semantic scales was done by the subject pointing out the scale position of a certain word by putting a mark ("X") on each of the 9 scales for each of the five words on five separate scales (having the same arrangement) on five different papers before saturation and on another five scales (on five different papers) after saturation. The discrimination of each scale was computed following Osgood et al. (1953).

**Experiment No. 4: HABITUATION**

This experiment was also conducted in the same room where the CS.
of all the apparatus (described earlier) was made in each a way using a screen that the subject was not in a position to see any one of those apparatus used.

For this experiment a Photoelectric Plethysmograph Model MFP - 2 along with its other accessories (described earlier) as to know the rate of habituation of the subject in response to an auditory stimulus (white noise) was used.

The subject was asked to lie down on a comfortable bed and to relax fully. After sometimes a pair of ear phones (with the help of a head band) was fixed on the subject's head. After this, the transducer (described earlier) was fixed on the left hand middle finger tip of the subject with a shielding strap so as to avoid interference of any external fluorescent lamp. Following this the experimenter went behind the screen and switched on the DC amplifier, the power supply to the transducer and the bulb. The electricity through the bulb was adjusted so that the deflections in the galvanometer came to a convenient position. As the aim of this experiment was to know only the rate of habituation, the electricity through the bulb was varied in different subjects according to their requirements so that the galvanometer showed sufficient deflection. Another condition for adjusting the illumination level of the bulb was that enough
electricity input passed through the transducer so that it could pick up the changes in the reflected light from the tissue under them. (Mention may be made here that proper care was taken to recharge the detector whenever necessary). Auditory stimuli of moderate frequency and intensity were delivered through the stimulus controller (mentioned earlier) for a duration of one second at an interval of ten seconds.

The experiment continued until three successive nil deflections were noted on the galvanometer for each subject. The number of auditory stimuli presented (excluding the last 3 successive trials showing nil deflection) was taken as a score of the subject for this experiment.

**Experiment No. = 5 ; REACTION TIME ;**

This experiment was conducted so as to measure the reaction time (RT) of the subject in different experimental conditions using the apparatus described earlier.

This experiment may again be broadly divided into two parts and each part into the following different stages depending upon the nature of the experimental procedures involved. The general instructions to the subject to sit comfortably on a chair facing the experimenter and the arrangement of the main apparatus using a screen so that the subject was not in a position to see any other parts of the
apparatus (which was not necessary for him, etc.) were all
through same excepting the novelty adapted in each of the
nine parts of this experiment which will be mentioned in
proper place.

Another important point which may be mentioned
here is that, in between two different stages of this ex-
periment about five minutes rest period and in between two
trials in each stage little time gap were given to all the
subjects which were thought to be sufficient enough to over-
come the boredom or fatigue effect, if any, which would
have set in during the whole experiment.

In each stage of this experiment practice trails
were given until the subject was able to make himself/herself
familiar with the procedure. Finally, twenty readings in
each of the nine stages were recorded the mean of which
was taken as the score of the subject in each stage separatel.

Part.-I. Simple R.T.

Stage (a) - In this experiment, the subject was given the
following instructions. "This is an experiment to find
how fast you can release this key (pointing the subjects'
key), every time as soon as you see a light here (point-
ing the place, where the subject was supposed
to look). You please be attentive to this particular place
and as soon as you see the light you are to release the key as fast as you can. To start with you keep the key pressed with your right index finger (in case of right handed person). Every time after you have released the key, press the key again as soon as the light will be off."

In this stage of the experiment, the R.T. of the subject was found without using any warning signal. The inter-trial interval varied between 4 seconds and 8 seconds with steps of 250 msec. at random. The R.T. for each trial was noted down.

Stage (b) & (c). In these two stages the general procedure for the experiment was same as used in stage (a), excepting that warning signal before the presentation of the stimulus was used and fore-periods were varied.

In stage (b), the fore-period was varied between 200 msec. and 1150 msec. with 50 msec. steps at random which has been called as 'short' fore-period and in stage (c), the fore-period was varied between 1200 msec. and 2150 msec. with 50 msec. steps at random which has been called 'long' fore-period in the present experiment.

The instructions given to the subject in both the stages of (b) and (c) were as follows: "This time you will see at first a flash of light in this bulb (pointing the bulb)
SIMPLE REACTION TIME

SIMPLE REACTION TIME ALONG WITH WHITE NOISE
Following this you will see another light in this place (pointing the place in the apparatus). You are required to press the key in the same way as before (stage - a.) soon after the arrival of the first light (again pointing the place where warning signal (light) will appear) and to release the key as fast as you can as soon as you see the flash of light (pointing the place again, where the stimulus light will appear). Please be attentive so that the moment you see the second light you can release your finger immediately". The R.T. in each stage was noted separately.

Stages - (d) & (e) - In these two stages the experimental design was the same as used in stages (b) and (c). The only novelty was the presentation of an auditory stimulus - (tone) between termination of the warning signal (light) and the termination of the stimulus light. The subject was asked to respond in the same way as before (stages - b & c). In these two stages of (d) & (e) there were two series with different fore-periods as in stages (b) and (c) respectively. The R.T. for each series in each stages was noted separately.

Part - III: Complex R.T.:

Stages - (f) & (g) - The basic experimental design in these two stages was same as (b) & (c) of simple R.T. except that red and white lights (stimulus lights) were presented at
random and the subject was asked to respond to the white light by his right and the red light by his left hand. The following instructions were given to the subject: "This time you are to use both the keys (pointing to the keys) kept on your right and left sides with your right and left hand respectively. As soon as you see the first light (pointing the place where the subject used to see the warning light) please press both the keys with your index fingers of both the hands. Following this you may see either red light or white light in this place (pointing the place where the stimulus light was expected to arrive). If you see red light, release only the left key (but not the right one) and if you see the white light, please release the right hand key as fast as you can (but not the other key).

In stage (f), the fore-period was varied between 200 msec. and 1150 msec. with 50 msec. steps at random and in stage (g), the fore-period was varied between 1200 msec. and 2150 msec. with 50 msec. steps at random as in (b) & (c) respectively. The R.T. for each stage was noted separately.

Stages - (h) & (i): In these two stages the experimental design was the same as that of stage (f) and (g) respectively, except that an auditory stimulus-tone was presented between the presentation of the warning light and the termination of the stimulus light. The fore-periods were also varied as that of stage (f) and (g) respectively. The subject was
The R.T. for each stage was noted separately with the help of a chronoscope as in all other stages of this experiment.

Table showing the details of fore-periods at random in each series and the random order of red (r) and white (w) lights (stimulus) use in choice R.T.

<table>
<thead>
<tr>
<th>Fore-periods in msec.</th>
<th>Choice R.T</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>1. 300</td>
<td>1250</td>
</tr>
<tr>
<td>2. 1000</td>
<td>1950</td>
</tr>
<tr>
<td>3. 950</td>
<td>2000</td>
</tr>
<tr>
<td>4. 750</td>
<td>1700</td>
</tr>
<tr>
<td>5. 900</td>
<td>1850</td>
</tr>
<tr>
<td>6. 350</td>
<td>1300</td>
</tr>
<tr>
<td>7. 800</td>
<td>1750</td>
</tr>
<tr>
<td>8. 1050</td>
<td>2100</td>
</tr>
<tr>
<td>9. 450</td>
<td>1400</td>
</tr>
<tr>
<td>10. 650</td>
<td>1600</td>
</tr>
<tr>
<td>11. 1100</td>
<td>2050</td>
</tr>
<tr>
<td>12. 700</td>
<td>1650</td>
</tr>
<tr>
<td>13. 550</td>
<td>1500</td>
</tr>
<tr>
<td>14. 250</td>
<td>1200</td>
</tr>
<tr>
<td>15. 500</td>
<td>1800</td>
</tr>
<tr>
<td>16. 1150</td>
<td>1450</td>
</tr>
<tr>
<td>17. 600</td>
<td>1350</td>
</tr>
<tr>
<td>18. 400</td>
<td>1550</td>
</tr>
<tr>
<td>19. 200</td>
<td>1900</td>
</tr>
<tr>
<td>20. 850</td>
<td>2150</td>
</tr>
</tbody>
</table>
Experiment No. 6: TIME PERCEPTION

Llewellyn - Thomas (1955) described a technique which amplifies a subject's error in the reproduction of time intervals by using positive feed-back. The technique used in this experiment was based on that of Llewellyn - Thomas, (also discussed by Costello - 1961).

A buzzer was used (as described earlier) as the standard. The subject was blind-folded and sat on a chair keeping the index finger of his/her right hand on a telegraph key (as shown in the picture). The buzzer was sounded initially for 5 sec. or 10 sec.; these periods were the initial standards and the order of presentation of the two periods was counterbalanced for the subjects used. The subject was instructed to press the key as soon as the buzzer stopped, thus sounding the buzzer again, and to keep the buzzer sounding by holding the key down for a period which he/she estimated to be the same as the standard. He/she was told not to count. He/she was to release the key and thus stop the buzzer at the end of the period of time he/she had estimated.

Five seconds after his judgement, the subject was presented with a further stimulus period which was his own reproduction of the last stimulus. The subject was told that the standards might not all be the same but was not told that feed-back was being used.
TIME PERCEPTION
The cycle was repeated ten times. The arrangement of the standard times was done in a pre-formed random manner (see the appendix) but the order of presentation was constant in case of all the subjects. The successive standards and judgements were recorded with a chronoscope.

**Experiment No.** - N(A) : **TWO-FLASH-THRESHOLD**

This experiment was conducted to know the two-flash threshold of the subject using the apparatus described earlier.

The subject was seated comfortably 10 feet away from the flash unit kept in a dark room. The stimulus control unit was kept in another room. The subject was given the following instructions after explaining to him/her the nature of the experiment. "You have to look attentively at the box (pointing the stimulus box) where you will see flashes of light. Every time you are to decide how many flashes you see. If you see only one flash, please call out 'one' and if two, please call out 'two.' (This was demonstrated to the subject). Everytime you will see one or two flashes. Now let us have a trial - please watch carefully."

The subject was shown two flashes with an interval of 50 msec. and another two flashes with 100 msec. interval. If the subject was found to respond correctly the
experiment started; otherwise the instructions were repeated till the subject understood it well (as it happened mostly in case of schizophrenic subjects). Flashes were presented with intervals from both the extremes. First flashes with intervals of 30 msec., 35 msec., 40 msec., and intervals - 100 msec., 90 msec., 80 msec., and so on were alternatively presented till the range between the lower limit and the upper limit was narrowed. After finding out this broad range, the interval was varied by one second. Thus, for example, in one case the order of presentation was following: 55, 75, 56, 74, 57, 73, 58, 72, 59, 71, 60, 70, 61, 69, 62, 68, 63, 67, 64, 66. The subject said that he saw only one flash till the interval was 64 msec. At 64 msec. the subject reported that he saw two flashes. This was taken as his threshold level.

**Experiment No. 7(B): Two-Flash Threshold Along with Auditory Stimulation:**

In this experiment the basic experimental design was the same as that used in experiment 7(A), the only novelty introduced here was the presentation of an auditory stimulus - tone simultaneously when the subject was seeing flashes of light. This auditory stimulus - tone was presented using a pair of ear phones connected with a sound producing transistor (described earlier).
TWO-FLASH THRESHOLD ALONG WITH AUDITORY STIMULATION
The procedure employed in this experiment was essentially an adaptation of that described by Klein and Krech (1953). The subject was blindfolded before he had any opportunity to view any of the apparatus or equipment. After the subject was seated comfortably in front of the apparatus, he/she was given a demonstration in the following manner so as to make it clear what was required of him/her.

Demonstration:

For this demonstration the Standard Test Object was used. The thumb and forefinger of the subject's right hand were inserted into the sliding rider of the Test Object and the thumb and forefinger of his/her left hand into the rider of the comparison scale.

The S was then shown/demonstrated that he/she could move the rider of the comparison scale back and forth and that as he/she moved the rider the width of the comparison scale changed. At this stage, the following instructions were given to the subject.

Instructions:

The subject was told that his/her task was to
move the rider until he/she felt that the distance between his/her thumb and forefinger of his/her left hand felt equal to the distance separating the thumb and forefinger of his/her right hand. When that point was reached, he/she was to announce "Here."

Finally, checks were made to make certain that the subject had understood the task. After the experimenter was satisfied that the subject understood what was required of him/her, experiment proper started.

Step I

Four control judgements were taken on the Standard Test Object. After each judgement the subject removed his/her fingers from the equipment, and the rider of the Comparison scale was brought back to its initial position. These control judgements (and all succeeding ones) were all taken with the rider of the comparison scale at the narrow end; i.e., all judgements were in the "up" direction.

To guard against the possibility that with repeated trials the subject would tend to rely upon position cues of the extended arms rather than in terms of the left width between the thumb and forefinger, the position of the comparison scale mount was irregularly shifted approximately four inches from its initial position on the table.
Following the same procedure mentioned above, stimulus periods of 90 seconds and 120 seconds respectively were used and four separate judgements for each of the two stimulus periods (90 sec. & 120 sec.) were recorded separately.

After the last judgement of the 120 seconds stimulation period, the apparatus was hidden from sight, the blind fold was removed from the subject, and a five minutes rest period was given. During the rest period the subject was allowed to smoke, converse, etc.

Following the five minutes rest period, the subject was again blind folded and four more judgements of the Standard Test Object (following the procedure mentioned in Step I of the present experiment) were taken/recorded separately.

After ten minutes rest period, following the same procedure mentioned in step VI of the present experiment, four more judgements were taken/recorded separately using the Standard Test Object. This concluded the experiment.
The purpose of this experiment was to know the process of adaptation, the rate of conditioning and extinction in different diagnostic groups of psychiatric patients.

This experiment was conducted in the same room where the GSR experiment was done (described earlier). At the initial stage of this experiment, the instructions given to the subject and the procedure adapted were almost same as that used in experiment No. 1 (described earlier). Only novelty introduced here was the use of ear phones (described earlier) so as to present conditioned stimulus and fixing of two electrodes with adhesive tapes on the right leg of the subject (with a gap in between these two being approximately 1 inch) which were connected with the inducto-rium (mentioned earlier). This was so arranged as to deliver shock (up to the intensity which the subject could tolerate) which served as unconditioned stimulus in this experiment (described earlier). While fixing ear phones and electrodes the subject was informed about it.

The experiment proper began shortly after the necessary connections had been fixed between the subject and the different parts of the apparatus through electric wires and was given a simple explanation of what was to happen.
GSR ADAPTATION, CONDITIONING AND EXTINCTION
The procedure used for the later part of this experiment was an adaptation of that described by Stewart et al. (1959) in relation to adaptation and conditioning of the Galvanic Skin Response in psychiatric patients.

The actual conditioning procedure fell into three phases. In the first phase (adaptation period), the subject was presented with the conditioned stimulus alone until there was no detectable GSR on three successive trials. In the second phase, (conditioning period), the paired conditioned and the unconditioned stimuli were presented for eleven trials. In the last phase (extinction period), the conditioned stimulus was presented alone until any detectable GSR in three successive trials could be observed. During each phase the interval between trials followed a schedule in which the time intervals varied randomly between 160 and 30 seconds (as recorded by an electrically operated watch). The phases followed each other without pause. The number of trials the subject took to come to a point where no detectable GSR deflection in three successive trials was noticed, in both the phases of adaptation and extinction was taken as his/her score for both adaptation and extinction respectively. The amount of deflection noted in 11 trials during conditioning phase of this experiment was taken as the score of the subject.
This experiment was carried out in a room free from any external noise and having sufficient light and ventilation. Adequate facilities for resuscitation were ensured prior to the experiment. The investigator was helped by a medical personnel and a staff nurse provided by the hospital.

Permission from the patient and/or relative to carry out this test was taken in order to avoid legal implications.

Each patient was asked to report for the test along with his/her own relative.

All the cases were tested during morning hours between 8 to 9 A.M. to avoid the effect of diurnal variation and also because all the patients were asked to stay in empty stomach since morning till the completion of the test. This was done to avoid dangers which could have occurred had they not carried out the instructions.

Before carrying out the test, the detail of the test was explained to the patient. Patient was also told not to become anxious following the test as he/she may feel drowsy for some time. The patient was acquainted with the
SEDATION THRESHOLD
apparatus and other persons who were presented in the room along with the investigator.

After noting the weight of the subject, he/she was asked to lie down on a bed and to relax comfortably. His/her blood pressure was recorded. Then the following instructions were given to the subject through a tape recorder ('National' Model AQ - 1945 - 4 track). "Listen Carefully to the instructions. Through the tape recorder you will hear some numbers, e.g., 3, 7, 2, 5, 8, etc. You are required to go on doubling the numbers until you are asked to stop. Thus, e.g., if you hear 2, immediately after this you are to double it and say 4. Now, if you hear 6, how much it would be after doubling? (The subject was asked to tell the answer. If he/she were wrong, he/she was given examples again until he/she was able to understand properly what he/she was supposed to do). After you have doubled one number please be ready for the next and so on. Now let us have a trial. Hear the numbers carefully and go on doubling:

6; 2; 9; 1;
3; 5; 8;".

When the subject was able to double the above mentioned series of numbers correctly, the experiment proper started. The digits (random numbers) were recorded on the tape recorder.

Bangalore University Library.
Jeeva Shashidhara
in a quiet manner by the investigator himself in a moderately clear voice. During the experiment proper the subject was again told through the tape recorder - "Now listen carefully and start doubling the numbers you hear through the tape recorder."

In all the cases Claridge and Herrington's (1960) "Digit doubling technique" has been followed for the estimation of sedation threshold with the following variations:

1. Thiopentone sodium was used instead of Amytal sodium due to latter's unavailability in the country.

2. Thiopentone sodium solution used was of 2.5 percent strength (Claridge and Herrington used Amytal sodium solution of 5 percent strength).

This was necessary as it has been reported (Goodman-Gillman - 1956) that complications are more frequent when Thiopentone sodium is administered in a more concentrated form.

3. Thiopentone sodium was administered at the rate of 50 mgm/minute, as it was seen in a previous experiment (Parekh - 1970), on Indian population that with 100 mgm./minute infusion it was usually difficult to get clear cut end points. 'Digit doubling technique' —
"Consisted of assessing the effects of intravenous amylobarbitone sodium (in our study Thiopentone sodium) on a simple task of doubling digits. The exact procedure was to present to the subject a tape recorded series of random digits played at the rate of one digit at every two seconds. The subject was required to respond by doubling the digits while receiving a continuous intravenous infusion of amylobarbitone sodium, (Thiopentone in our investigation), administered at the rate of 100 mgm./minute, the solution being prepared so that 2 cm.\(^3\) contained 100 mgm. (in our study 4 cm\(^3\) contained 100 mgm. and administered at the rate of 50 mgm./minute with a 20.0 c.c. intravenous syringe). The digits were grouped on a score sheet in blocks of five and during the test the number of errors per block was noted, an error being regarded as an incorrect doubling response, the repetition of digit, or a complete failure to respond. The injection was continued until errors exceeded 50 percent in two consecutive blocks of digits. The sedation threshold was then taken as the point midway between the last two blocks with less than 50 percent error and the first two blocks with more than 50 percent error. The amount of drug administered up to that point could then be determined accurately from a chart relating blocks, and hence, time, to drug received. This dosage was then corrected for the body weight of the subject, giving the sedation threshold in the conventional form of mgm./kgm."
During the test injection was given intravenously in right ante-cubital vein under strictly sterile condition. The syringes and needles were boiled in the sterilizer and Thiopentone sodium was given by the medical personnel with a 20.0 c.c. glass van syringe containing 2.5 per cent solution and 22 inches guze needles. The rate of injection was controlled by "seconds" stop watch. The digits were reproduced on the tape recorder which was kept at a distance of two feet away from the right ear of the subject. The volume and tone of the tape recorder was kept at the same intensity in all the cases.

The scoring on the sedation threshold record sheet was noted by the investigator.

After concluding the test the patient went to sleep and he/she was allowed to get up from the bed only when he/she became fully alert.

On the last day of the experiment each patient was given a prescription (prescribed by the chief psychiatrist) according to the illness the patient was suffering from. Thus -

in case of anxiety — Diazepam, 5 mg. one tablet t.d.s.

in case of schizophrenia — Chlorpromazine, 50 mg.

one tablet t.d.s.; and
in case of Depression (Endogenous) — Imipramine hydrochloride, 25 mg. one tablet t.d.s., daily.

The patient's relatives were advised to take care that the patient would take drug regularly as prescribed. Every week the patient was asked to meet the experimenter as well as the chief psychiatrist so as to report the nature of improvement and also any other unwanted side effects, if there were, after medication. (Mention may be made here that, no change in prescription was necessary during the period of this investigation).

After three weeks of medication, post-treatment assessments were done. Following Agnew et al. (1960-61), Rees et al. (1961), Marks and Pare (1965), Dally (1967), and Koegler and Brill (1967) it was thought that three weeks time would be enough for the patients to show improvement after medication if at all, that particular drug was having any effect on them.

The whole experimental procedure (both subjective and objective measures) described earlier was repeated during post-treatment assessments on all the 70 patients taken for the assessment during pre-treatment phase of this investigation.