CHAPTER III

METHOD
CHAPTER-III

METHOD

As reported earlier, the present investigation was designed with several objectives in view. Firstly, it intends to study the relationship between response entropy and emotional indicators so that if necessary the influence of response entropy is controlled; Secondly it intends to study the structural relationship between emotional indicators and psychometric measures of anxiety, psychoticism, neuroticism, psychopathic deviation and creativity; Thirdly, it proposes to study whether pairs of indicators or three indicators occurring jointly for the same stimulus word provide better criteria for emotional disturbance than single indicators. In other words, the objective was to ascertain if the diagnostic potency of emotional indicators increases with the increase in the number of emotional indicators occurring together for the same stimulus word; and Fourthly, it proposes to verify which of the word association test responses (ranging from common to unique on five point scale) are related to creativity and which of the word association test responses are related to anxiety, psychoticism, neuroticism, and psychopathic deviation.

Here, it goes without saying that in all the sciences, psychology and educational sciences cannot be an exception to it, empirical verification of the proposed hypotheses is
dependent, firstly, on the precise measurements of the variables of ultimate interest, and secondly, on the methods and procedures employed for deriving conclusions from such measurements. This required: (a) selection of appropriate tools that could be profitably used for reliable measures, (b) selecting adequate sample, and (c) selecting suitable statistical techniques for analysing the obtained data.

Thus, it seems appropriate to describe the specific tools, sample and the methods and procedures employed in completing the research being reported. The description of the sample providing data for testing the proposed hypotheses, and the tools employed for different measures is given in the subsequent pages. This chapter also describes the method of computing response entropy value of different stimulus words and details of the procedure for selecting stimulus words of average response entropy value. It also explains the procedure followed to obtain scores on various word association emotional indicators derived from Kent-Rosenoff word association test. In addition, this chapter also describes the procedure followed in the administration and scoring of different tests.

Subjects

Subjects for this investigation were male students (N = 250) drawn from different senior secondary schools functioning under the Directorate of Delhi Administration,
Delhi. The rationale for limiting the present study to males was mainly convenience, besides the need to control the sex variable. Only XI and XII grade students were selected to control the influence of educational level. Sampling might be described as incidental for only those schools were covered where access to students could be possible. The age of the subjects ranged from 16 to 19 years with a mean and standard deviation of 16.48 and 1.01 years, respectively. Class-wise split up of the total sample is as given below:

Table 3.1
Class-wise Distribution of the Students

<table>
<thead>
<tr>
<th>Class</th>
<th>Number of Students</th>
<th>School</th>
</tr>
</thead>
<tbody>
<tr>
<td>XI</td>
<td>65</td>
<td>S.B.M.S.S. * Shivaji Marg, New Delhi</td>
</tr>
<tr>
<td>XI</td>
<td>69</td>
<td>G.B.S.S.S. ** No. 1, Tilak Nagar, New Delhi</td>
</tr>
<tr>
<td>XI</td>
<td>55</td>
<td>G.B.S.S.S. No. 2, Tilak Nagar, New Delhi</td>
</tr>
<tr>
<td>XII</td>
<td>15</td>
<td>G.B.S.S.S. No. 2, Tilak Nagar, New Delhi</td>
</tr>
<tr>
<td>XI</td>
<td>31</td>
<td>G.B.S.S.S. B-Block, Janakpuri, New Delhi</td>
</tr>
<tr>
<td>XII</td>
<td>15</td>
<td>G.B.S.S.S. B-Block, Janakpuri, New Delhi</td>
</tr>
</tbody>
</table>

* Swatantra Bharat Mill Senior Secondary School
** Government Boys Senior Secondary School

The subjects were contacted through principals and teachers. The investigator being a counsellor in one of the
schools functioning under the Directorate of Delhi Administration, Delhi knew some of the principals and teachers. It proved very helpful in contacting the subjects and establishing psychological rapport.

Subjects were told that the information was being collected purely for research purpose. They were also assured that the information to be collected would remain strictly confidential, and presented only in a form in which no person could be identified. The promise of privacy appeared to have gone a long way in establishing psychological rapport, since a large number of subjects contacted the investigator later on and enquired about their performance on the tests used.

Tests

The following tests were used:

(A) Word Association Test (Kent-Rosenoff, 1910);
(B) IPAT Anxiety Scale Questionnaire (Cattell and Scheier, 1963);
(C) Eysenck Personality Questionnaire (Eysenck and Eysenck, 1975);
(D) Torrance Test of Creative Thinking: Figural and Verbal Form A (Torrance, 1966); and
(E) Minnesota Multiphasic Personality Inventory: Psychopathic Deviate Scale (Hathaway and McKinley, 1967).
A considerable literature exists which attests to the fruitfulness of the association test as a laboratory technique for the study of defence mechanisms, emphasizing particularly the modern concepts of sensitization and repression (Carlson, 1954). As an association test, the Kent-Rosenoff word association test has enjoyed widespread use in both the laboratory and clinic for more than half a century. The test consists of 100 common words, mostly nouns and adjectives. Out of hundred stimulus words, sixty-six were borrowed from Sommer's list. The norms were prepared on 1000 normal adults. The test has retained its position as a standard laboratory technique. Additional norms have been prepared by several investigators and the test has been extensively employed in research on verbal behaviour and personality (Russell and Jenkins, 1954; Jenkins and Russell, 1960; Palermo and Jenkins, 1964). The test has also been used in India and found useful for differential diagnosis (Rundal and Upmanyu, 1974, 1981; Upmanyu, Gill and Singh, 1982).

During administration, the subject is required to give as quickly as possible, the first word that he can think of in response to each stimulus word presented by the experimenter. The word associations can be scored to diagnose emotional disturbance of the subjects.
The IPAT anxiety scale questionnaire was developed from extensive research and practice as a means of getting information about second-order anxiety factor in an objective manner. It is based on a second-order anxiety factor defined by five oblique first-order factors of 16 PF (Cattell, 1956; Cattell et al. 1957). It is a brief, non-stressful, clinically valid questionnaire for measuring anxiety, appropriate for high school students and adults. The test is easily administered individually or to a large group of subjects at one time.

The questionnaire consists of 40 questions distributed among the five anxiety measuring factors. A brief description of the five factors is given below:

<table>
<thead>
<tr>
<th>Factors</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q₃ (-)</td>
<td>defective integration, lack of self-sentiment;</td>
</tr>
<tr>
<td>C (-)</td>
<td>ego weakness, lack of ego-strength;</td>
</tr>
<tr>
<td>L</td>
<td>suspiciousness or paranoid-insecurity;</td>
</tr>
<tr>
<td>O</td>
<td>guilt proneness;</td>
</tr>
<tr>
<td>Q₄</td>
<td>frustrative tension or id pressure.</td>
</tr>
</tbody>
</table>

Each item of the questionnaire has three response alternatives and any single item contributes to only one of the five components. The scale is designed to give a
The total composite anxiety score and also the scores on five different components. The total anxiety score can also be divided into covert and overt anxiety scores.

A vast amount of research, supporting and developing the rationale and validity of the anxiety scale, has been conducted (Cattell, 1956, 1957, 1959; Cattell and Scheier, 1961). The reliability and validity of the questionnaire have been found to be satisfactory by the authors. The test has also been used in India and found reliable (Hundal, Sudhakar and Sidhu, 1972; Hundal and Upmanyu, 1974, 1981; Upmanyu and Singh, 1984).

(C) Eysenck Personality Questionnaire
(Eysenck and Eysenck, 1975)

Eysenck Personality Questionnaire is based on item factor analysis on large samples of adults. It is now in widespread use as an extension of and replacement for the Eysenck Personality Inventory (Eysenck and Eysenck, 1971, 1972, 1976, 1977; Teasdale, Segraves and Zacune, 1971; Claridge and Chappa, 1973; Eaves, 1973).

The questionnaire as currently constituted presents a three dimensional analysis of personality, with orthogonal super-factors of extraversion-introversion (E-I), neuroticism (N), and psychoticism (P). In addition, it includes some lie scale (L) items. Thus, it provides an additional scale,
i.e., P scale. The three other scales in it - extraversion, neuroticism and lie scale have already been used in Maudsley Personality Inventory, Eysenck's Personality Inventory, and Junior Personality Inventory.

Regarding the scores on lie scale items, a number of interpretations have been offered by different persons. It is variously described as "desire to conform to social norms" (Edwards, 1959; Edwards and Heathers, 1962), "ideal self" (Michaelis and Eysenck, 1971), "nice personality" (Skinner et al. 1970), "motivational distortion" (Cattell, 1965), etc. It is also called "faking good" response set. The subject has a motivation to give a false picture of self, rather a better picture of self than he really is.

This tendency was viewed as more or less an error to be avoided or response bias to be overcome, counter balanced or suitably corrected. Lately there has been a tendency amongst various investigators to consider it as a separate, independent and powerful personality factor, to be measured in its own right (Edwards, 1964; Michaelis and Eysenck, 1971 and Verma, 1977). The present study did not attempt to exclude cases on the basis of lie-scale, instead lie-scale was used as an important dimension of personality.

Despite its recent origin the questionnaire is backed by a growing body of evidence bearing on such matters as
factor stability and reliability (Eysenck and Eysenck, 1968, 1975, 1976), differentiation of drug users from non-drug users (Teasdale, Segraves and Zacune, 1971), as well as imprisoned criminals and matched controls (Eysenck and Eysenck, 1971). In addition, Farley and Goh (1976) found that most of the reliability estimates are satisfactory for most uses.

More recently, Bishop (1977) and Block (1977) have criticised the concept of 'psychoticism', embodied in the Eysenck Personality Questionnaire (Eysenck and Eysenck, 1976a, 1976b). Block (1977) suggested that more work is needed on the P-scale before it is offered for use to the scientific and professional communities. However, in a brief rejoinder to these critiques, Eysenck (1977) concluded that there is much evidence for the viability of the concept of psychoticism and for the validity of the questionnaire measurement of psychoticism.

The test has also been used in India and found suitable (Verma and Wig, 1972; Upmanyu, Gill and Singh, 1982; Upmanyu and Singh, 1984). In brief, Eysenck Personality Questionnaire is fairly reliable and valid for estimating measures pertaining to psychoticism, neuroticism, extraversion and dissimulation.
In the domain of creativity as a field of research, the Torrance test battery for assessing creative potential of the individual has attained wide popularity. It comprises of 7 verbal, 3 figural tests or better 'activities'. Each sub-test presumably involves different kinds of thinking and contributes something unique to the battery. A description of these tasks reveals their diversity:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Verbal tasks</th>
<th>Time allotted</th>
<th>Figural tasks</th>
<th>Time allotted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Asking questions</td>
<td>5 minutes</td>
<td>Picture construction</td>
<td>10 minutes</td>
</tr>
<tr>
<td>2.</td>
<td>Guessing causes</td>
<td>5 minutes</td>
<td>Picture completion</td>
<td>10 minutes</td>
</tr>
<tr>
<td>3.</td>
<td>Guessing consequences</td>
<td>5 minutes</td>
<td>Lines</td>
<td>10 minutes</td>
</tr>
<tr>
<td>4.</td>
<td>Product improvement</td>
<td>10 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Unusual uses</td>
<td>10 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Unusual question</td>
<td>5 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Just suppose</td>
<td>5 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the first three "Ask and Guess" activities, the subject is shown a picture of an elf-like form observing his reflection in the water. The subject is asked first to list
all the questions he can think of about the picture; then to state as many possible causes as he can of the occurrence in the picture, and finally he is requested to mention possible consequences of the pictured situation.

For the product-improvement task, a stuffed toy elephant is presented and the subject is asked to think of all the clever and unusual ways in which he can alter it to make it more funny for children to play with, and to list these suggestions.

The unusual uses task requires that the subject lists interesting and unusual uses for cardboard boxes, while in the unusual questions task, the subject is to suggest unusual questions about cardboard boxes.

Finally, in the just suppose sub-test, the subject is presented with an improbable situation (clouds having strings attached that hang down to earth) and is asked to describe all the things that might happen if such an improbable situation should occur.

Among the figural tasks, the picture construction activity requires the subject to draw something clever and unusual, using an egg-shaped piece of paper as the basis for his picture.
The picture completion activity presents the test taker with a variety of abstract lines or designs which he is to sketch into unusual pictures or objects.

Finally, the parallel lines activity is the same except that all the line forms are the same pairs of straight parallel lines.

Although the basic activities differ, each is scored for fluency, flexibility, originality and elaboration. This is done on the assumption that one can engage in the range of problem-solving activities either creatively or uncreatively. The number of relevant responses produced by a subject yields the measure of fluency. The number of different categories of questions, causes, consequences, products or uses gives a measure of flexibility. The statistical infrequency of these responses is the measure of originality, and the number of embellishments on responses provides an elaboration score.

Scores for fluency, flexibility, originality and elaboration can be summed separately across all verbal and across all figural sub-tests, again suggesting similarity in the creative process across a variety of different activities.

While Torrance test battery has been used quite extensively by researchers working in the field of creativity, some writers (Wallach and Kogan, 1965; Wallach, 1970) have critically alleged that Torrance tests of creative thinking
are essentially measures of intelligence. Torrance, however, regards their assertion as incorrect and has provided acceptable rationale for and also empirical proof of the distinct nature of his tests which he feels operationalize what is known about the "nature of creative thinking process, the qualities of the creative products and creative personalities" (Torrance, 1967, 1968, 1969, 1974).

Regarding the reliability of the test-battery, it is reported by the author in the testing manual to be satisfactory. The test-retest reliabilities of the Torrance tasks, over intervals of one week to eight months, range from .34 to .97 (Eherts, 1961; Sommers, 1961; Goralski, 1964; Wodtke, 1964). In the Indian settings, too, tests have been found to be quite reliable (Gakhar and Luthra, 1973; Gakhar, 1975).

(3) Minnesota Multiphasic Personality Inventory: Psychopathic Deviate Scale (Hathaway and McKinley, 1967)

The Minnesota Multiphasic Personality Inventory (MMPI) is designed to provide an objective assessment of some of the major personality characteristics that effect personal and social adjustment. The inventory was originally developed "to assay those traits that are commonly characteristic of disabling psychological abnormality" (Hathaway and McKinley, 1967, p. 1).
The nine MMPI originally developed scales described briefly below are often referred to as the 'clinical' scales. The clinical scales are all empirical scales developed by selecting items which differentiated between two groups. The criterion groups for all but two of the scales consisted of individuals with some type of personality disorder. The trait names assigned to those scales are those that correspond to the psychiatric diagnosis of individuals in the criterion groups. The nine clinical scales along with their abbreviations are as follows: hypochondriasis (Hs); depression (D); hysteria (Hy); psychopathic deviate (Pd); masculinity-femininity (MP); paranoid (Pa); psychasthenia (Pt); schizophrenia (Sc); and hypomania (Ma). Many other scales have subsequently been developed from the same items; social introversion is one that is commonly scored. There are also three validating scales: lie (L); validity (F); and correction (K).

The inventory consists of 550 affirmative statements covering a wide range of subject matter from the physical condition to morale and social attitude of the individual being tested. The subject is asked to sort all the statements in three categories: 'True', 'False', and 'Cannot say'. The inventory items can be presented to the subject either in a card (box) form for individual use or in a booklet with separate answer sheet suitable for both individual examinations and group testing. Both these forms were designed for adults.
from about 16 years of age upward, although they have also been employed successfully with somewhat younger adolescents (Hathaway and Monacheri, 1963).

The data which have been reported on the reliability of the MMPI appear to be quite satisfactory. The authors (Hathaway and McKinley, 1942; McKinley and Hathaway, 1942, 1944), using the card form with unselected normals, reported test-retest coefficients, ranging from .57 to .83, for six of the clinical variables.* The time between testings varied from three days to more than one year. Cottle (1950) reported test-retest coefficients ranging from .46 to .91 for unselected normals who took both the card form and the group-form within one week. Holzberg and Alessi (1949) reported test-retest coefficients for unselected psychiatric patients who took both the complete version and shortened version of the card form within three days. Coefficients of correlation ranged from .52 to .93.

As for validity, "a high score on a scale has been found to predict positively the corresponding final clinical diagnosis or estimate in more than sixty per cent of new psychiatric admissions" (Hathaway and McKinley, 1967, p. 8).

In the present investigation a card form of psychopathic deviate (Pd) scale containing 50 items has been used. This scale measures the personality characteristics of the moral and a social sub-group of persons with psychopathic personality

* Hypochondriasis, Depression, Hysteria, Psychopathic deviate, Psychasthenia and Hypomania.
disorders, termed in this setting psychopathic deviates (McKinley and Hathaway, 1944). The major features of this personality pattern include a repeated and flagrant disregard for social customs and mores, and an emotional shallowness in relation to others, particularly in sexual and affectional display. Since the individual is relatively free of conflicts and does not show anxiety until actually in serious difficulty and the situation demands evidence of sense of responsibility, appreciation of social patterns, or personal and emotional loyalties. In studies of corresponding psychiatric groups that were tested a second time before therapeutic measures or milieu could be expected to have important effects (e.g., Rosen, 1953), psychopathic deviate scale scores generally appear to be very stable. Furthermore, a few authors (Hathaway and McKinley, 1942; McKinley and Hathaway, 1942, 1944, and Cottle, 1950) using the psychopathic deviate card form reported test-retest reliability coefficient for the normal subjects to be .71 and .80, respectively, whereas Holzberg and Alessi (1949) applied the same scale on unselected psychiatric patients after the time gap of three days and found test-retest coefficient to be equal to .52.

In brief, it can be stated that the psychopathic deviate scale of Minnesota Multiphasic Personality Inventory has been used with success in clinical settings as well as for research purposes.

Administration of Tests

Administration of tests required five sessions. The tests were administered in a uniform sequence, generally on
five consecutive days. In the first session, word association test was administered to one subject at a time. In the second session, Eysenck personality questionnaire was completed. In the third session, anxiety scale questionnaire and psychopathic deviate scale were administered. A time gap of fifteen to twenty minutes was allowed in between the administration of two tests so that the effect of fatigue, if any, may be dissipated. In the fourth session figural form A of Torrance test of creative thinking was completed, while in the last session students took verbal form A of Torrance test of creative thinking.

Word association test was administered to one subject at a time while all the other tests were administered in a group setting. Specific research group generally comprised of fifteen to twenty subjects. As it happens many a time in psychological research, collection of data was not very easy. Lengthy time required for the administration of tests and some times lack of research consciousness on the part of the subjects tended to make it really tedious at times. Sincere efforts, however, were made to establish rapport with the subjects in order to elicit reliable and authentic information. Subjects were told that the information was being collected purely for research purpose. They were also assured that the information to be collected would remain strictly confidential and presented only in a form in which no person could be
identified. The promise of privacy appeared to have gone a long way in establishing psychological rapport, since a large number of subjects contacted the investigator later on and enquired about their performance in the tests used. Cooperation of various principals and teachers also helped in drawing out reliable information from the subjects.

Most of the tests (Eysenck personality questionnaire; anxiety scale questionnaire, psychopathic deviate scale, and Torrance test of creative thinking, verbal and figural form A) were administered in accordance with the instructions provided in the respective test manuals. The instructions for respective tests were read aloud to the group comprising of fifteen to twenty subjects. The instructions in typed form were also provided to the subjects. The doubts of the subjects were removed before permitting them to take the test. Each form was checked to see if any omission was there and if so, the particular subject was asked to complete that question or questions. Word association test was administered as discussed below.

Word Association Test

Word association test was administered to one subject at a time. Testing sessions of about 45 minutes each were held at a predetermined place free from any disturbance.

On every testing session after a few minutes of informal talk and in an atmosphere made as casual and relaxed as possible,
the subject was given a sheet of paper having the following instructions, which were also read aloud for him.

Instructions:

"I am going to read a list of words. After each word, answer as quickly as possible with the first word that comes to your mind. The word may or may not be related to the word which I speak. Speak the first word that comes to your mind as quickly as possible. For example, I might say the word 'bazaar' and you might think of the word 'shop' or 'street' or 'man' in the first instant. I would like you to give the response as quickly as possible, since I am going to note down the time taken by you for giving the response. Do you have any question?"

If the subject indicated that he did not understand, the investigator repeated the appropriate part of the instructions. Practice was given on five words which were not included in Kent-Rosanoff word association test.

The 100 stimulus words of the list were read off one at a time. The subject's response, reaction time and reactions, such as repetition of the stimulus word before giving the response, failure to make any response were noted. The reaction time was measured by a stop watch to the nearest one-tenth of
a second, from the initiation of the stimulus word by the investigator to the initiation of the response by the subject.

After the completion of the list, the investigator gave the following instructions:

"I am going to present the same list of words again. After each word that I read, try to give the same response word that you gave on the first presentation of the list. For example, if I had said 'bazar' and you had responded 'shop' on the first presentation of the list, then this time also you should say 'shop' after I read off the word 'bazar'. For this purpose, you may take as long as you wish."

If any subject had difficulty in understanding the instructions, the investigator repeated the appropriate part of the instructions and made it perfectly clear to the subject.

The 100 words of the list were again read off in the same order and only one at a time. Emotional indicators, such as, forgetting and misremembering were recorded.

**Scoring of the Tests**

**Word Association Test**

Word association test was scored to identify the position of the subjects on the following indicators:
1. Different Categories of Word Association Test Responses

Following Gough (1976) the word association test responses of each subject were categorized into five distinct categories. The protocol for any respondent would therefore yield five part scores, depending on the distribution of his associations over these five categories. The categories were:

(a) **Very Common Responses (VCR)**

Any response given by 50 per cent or more of the subjects was categorized as very common response.

(b) **Common Responses (CR)**

Any response given by 25 per cent to 49.9 per cent of the subjects was labelled as common response.

(c) **Less Common Responses (LCR)**

Responses given by 10 per cent to 24.9 per cent of the subjects were categorized as less common responses.

(d) **Moderately Infrequent Responses (UR')**

Any response made by 1 per cent to 9.9 per cent of the subjects was scored as moderately infrequent response.

(e) **Unique Responses (UR)**

Any response made by less than one per cent of the subjects to a particular stimulus word was scored as unique response.

*This index was not included in the main analysis since it occurred too infrequently.*
2. **Long Reaction Time (LET)**

Following Hull and Lugoff (1921), Laffal (1955) and Brown (1965) a reaction time of 2.6 seconds or longer was scored as long reaction time. This procedure differs from some in which the distribution of each subject’s reaction time is taken and reaction times one standard deviation above the mean or otherwise falling at the upper extreme are taken as faults. Hull and Lugoff (1921) found that using 2.6 seconds as a cutting point for faults yielded results very similar to those using individual distributions. Their finding provides the rationale for the use of the absolute cutting point in the present study.

3. **Repetition of the Stimulus Before Responding (RSBR)**

This indicator was scored when the subject repeated the stimulus word before giving the response.

4. **Reproduction Failure**

Two types of reproduction failure were scored. These were forgetting (Fg), when the subject indicated that he was unable to recall the initial response, and misremembering (W), when the subject gave a different response on retest. Forgetting and misremembering, of course, are mutually incompatible, and cannot co-occur.
Brown (1965) reported that previous practice in scoring reproduction failure has varied; Laffal (1955) apparently counted both forgetting and misremembering as reproduction failure, while Levinger and Clark (1961) only counted forgetting. Since Brown (1965), Hundal and Upmanyu (1974), and Kuntz (1974) found differences in the two types of reproduction failure, it seems advisable to keep them separate.

5. Perseveration

Following Brown (1965), Hundal and Upmanyu (1974), and Kuntz (1974), two indicators of perseveration were scored. These were stimulus repetition (SR) and response repetition (RR). Response repetition was scored when a subject responded with a word already used as a response to a previous stimulus, and stimulus repetition, when a subject used a previous stimulus word from the list as a response. However, when different stimulus words which are closely associated with one another appear in the same list, true associations may also occur which fulfill the above definitions of response repetition and stimulus repetition. For example, a common response to stimulus words 'man' and 'beautiful' is 'woman'. Because stimulus word 'beautiful' occurs after stimulus word 'man' in the word list, the response of 'woman' to 'beautiful' inflates the response repetition scores due to the composition and arrangement of the list. In an attempt to avoid scoring such cases as

* Stimulus repetition occurred too infrequently to permit statistical analysis and thus it was excluded in the main analysis.
perseveration, following Brown (1965) and Kuntz (1974), no response given to a particular stimulus word by more than five per cent of the subjects was regarded as an instance of response repetition or stimulus repetition. It should be noted that these two emotional indicators are independent and could co-occur.

**Anxiety Scale Questionnaire, Eysenck Personality Questionnaire and Psychopathic Deviate Scale**

The tests were scored strictly in accordance with the procedure suggested by the authors. The anxiety scale questionnaire was scored for composite anxiety score as well as five sub-tests (factors Q3-, C-, L, O and Q4). Further, Eysenck personality questionnaire provided scores on four personality measures pertaining to psychoticism, neuroticism, extraversion and dissimulation. In addition, the measure concerning psychopathic deviation was obtained by scoring subject's responses on psychopathic deviate scale of MMPI.

**Torrance Test of Creative Thinking**

Following the procedure given in the manuals, figural form 'A' was scored for four measures of creativity (fluency, flexibility, originality and elaboration), while verbal form 'A' provided three measures of creativity (fluency, flexibility and originality).
Computation of Response Entropy of Stimulus Words of Kent-Rosenoff Word Association Test

In order to facilitate the computation of response entropy, the responses of 250 subjects to 100 stimulus words were tabulated, showing the number of different responses (D) to each stimulus word, and the code number for the emotional indicators with respect to each response was entered in the appropriate cells. The response entropy (H) for each word was calculated using Laffal's formula: \( H = -\sum p_i \log_2 p_i \) (Laffal, 1955), where \( p_i \) is the probability of occurrence of a given response. The details of the procedure are explained by way of an example.

Consider the responses given by 250 subjects to the stimulus word 'BLACK'. The responses of the subjects and the frequencies of their occurrence are reported in Table 3.2.

A perusal of Table 3.2 reveals that a total number of 45 different response words were given by 250 subjects, with the number of subjects varying for each response.

Thus, each response has a different probability of occurrence. The probability of occurrence of a response \( p_i \) was computed for each response separately by the formula:
\[ p_i = \frac{f}{N} \]
where \( f \) denotes frequency of occurrence of a response.

*The negative sign in the formula merely provides for a positive value of H.*
Table 3.2

Frequency (f), Probability of Occurrence (p.) and Response Entropy Value (-\( p_i \log_2 p_i \)) of each response to the stimulus word 'Black' (N = 250)

<table>
<thead>
<tr>
<th>Response Word</th>
<th>f</th>
<th>( p_i )</th>
<th>(-p_i \log_2 p_i)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>52</td>
<td>0.208</td>
<td>0.4712</td>
</tr>
<tr>
<td>Dark</td>
<td>46</td>
<td>0.184</td>
<td>0.4494</td>
</tr>
<tr>
<td>Colour</td>
<td>38</td>
<td>0.152</td>
<td>0.4131</td>
</tr>
<tr>
<td>Board</td>
<td>24</td>
<td>0.096</td>
<td>0.3246</td>
</tr>
<tr>
<td>Night</td>
<td>20</td>
<td>0.080</td>
<td>0.2915</td>
</tr>
<tr>
<td>Hair</td>
<td>7</td>
<td>0.028</td>
<td>0.1444</td>
</tr>
<tr>
<td>Shoe</td>
<td>6</td>
<td>0.024</td>
<td>0.1291</td>
</tr>
<tr>
<td>Shirt</td>
<td>6</td>
<td>0.024</td>
<td>0.1291</td>
</tr>
<tr>
<td>Red</td>
<td>4</td>
<td>0.016</td>
<td>0.0955</td>
</tr>
<tr>
<td>Paper</td>
<td>4</td>
<td>0.016</td>
<td>0.0955</td>
</tr>
<tr>
<td>Light</td>
<td>3</td>
<td>0.012</td>
<td>0.0766</td>
</tr>
<tr>
<td>Cloth</td>
<td>3</td>
<td>0.012</td>
<td>0.0766</td>
</tr>
<tr>
<td>Blackness</td>
<td>2</td>
<td>0.008</td>
<td>0.0557</td>
</tr>
<tr>
<td>Cloud</td>
<td>2</td>
<td>0.008</td>
<td>0.0557</td>
</tr>
<tr>
<td>Pen</td>
<td>2</td>
<td>0.008</td>
<td>0.0557</td>
</tr>
<tr>
<td>Chair</td>
<td>2</td>
<td>0.008</td>
<td>0.0557</td>
</tr>
<tr>
<td>Pain, elephant, face, coat, buffallow, crow, cow (each)</td>
<td>1</td>
<td>0.004</td>
<td>0.0319</td>
</tr>
<tr>
<td>darkness, cap, man, body, almirah, blackey, money, house, cobra, umbrella, tree, unlike, precipitate, bull, sofa, universe, unseen, radiation, cottage, spot, enlightenment and green</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total number of different responses (D) : 45

\[ H = - \sum p_i \log_2 p_i \] : 3.8445
word and \( N \) is the number of subjects in the sample. For the response word 'white', \( p_1 = \frac{82}{250} \) i.e., 0.328. The \( p_1 \) values computed for all the responses to the stimulus word 'black' are reported in column 3, Table 3.2.

Further the \( p_1 \) values for the various responses to the stimulus word were used to compute \( -p_1 \log_2 p_1 \) for each response word separately, with the help of Newman's Table (Newman, 1951). The values of \( -p_1 \log_2 p_1 \) computed for each response word are reported in column 4, Table 3.2. The sum of \( -p_1 \log_2 p_1 \) for all the responses elicited by the stimulus word 'black' is the value of response entropy for the stimulus word. In the solved example, the response entropy value for the stimulus word 'black' is 3.8445.

From this example, it may be seen that a stimulus word to which the group gives many different responses will have high response entropy value. The response entropy values for 100 stimulus words of Kent-Rosanoff word association test are shown in Appendix I.

**Computation of the Potential of Each Stimulus Word to Elicit Various Word Association Emotional Indicators**

Following the procedure detailed earlier (pp.75-78), the word association emotional indicators were identified from the responses of 250 subjects to the 100 stimulus words of the Kent-Rosanoff word association test. The identified
emotional indicators were used to find the potential of each stimulus word to elicit various types of emotional indicators. This was done by counting the frequency of seven categories of emotional indicators in the total responses of 250 subjects to each stimulus word. The seven categories pertain to: (1) long reaction time, (2) repetition of stimulus before responding, (3) misremembering, (4) forgetting, (5) response repetition, (6) unique response, and (7) moderately infrequent response. Since only seven categories of word association emotional indicators were located, the above analysis provided the same number of scores for each stimulus word, indicating thereby its potential to elicit various types of word association emotional indicators.

Thus, for each stimulus word, eight types of score were available: (i) scores on seven categories of word association emotional indicators elicited by the respective stimulus word, and (ii) response entropy value of the stimulus word. From this information the relationship of response entropy with word association emotional indicators was studied.

Here, it is pertinent to emphasise that out of five categories of word association detailed earlier (p. 75), only two categories of word association were used for studying their relationship with response entropy. This was done in
view of the following points:

(1) response entropy is derived from the nature of response hierarchy of the stimulus word. The response hierarchy includes all the five categories of word association. As such the correlations of response entropy with different categories of word association would mean the correlations of whole with parts. In the light of this argument the correlations are expected to be positive; and

(2) unique and moderately infrequent word associations, however, were retained for studying their relationship with response entropy since unique and moderately infrequent word associations have been commonly employed as emotional indicators by different investigators.

Computation of Scores on Various Word Association Emotional Indicators For "Each Subject"

In this case the scores on various emotional indicators were obtained for each subject. This computation differs from the one discussed in the earlier paragraph in the sense that in this computation, the scores on different emotional indicators are obtained for each subject, whereas the computational procedure described in the preceding paragraph refers to scores on different emotional indicators for each stimulus word.

* Very common responses, common responses, less common responses, moderately infrequent responses, and unique responses.
Following the procedure detailed earlier (pp. 75-78), the word association emotional indicators were identified from the responses of 250 subjects to the 68 stimulus words* of average response entropy value. These identified word association emotional indicators were used to obtain the scores for each subject on nine word association emotional indicators** by counting the frequency of occurrence of the categorized emotional indicators located in the word association test responses of the concerned subject. A frequency occurring in any of these nine types of emotional indicator was given a score of 1. The total score for each category of emotional indicators for each subject was obtained by adding up his categorized emotional indicators over the whole test. Thus, for each subject there were nine types of score concerning nine word association emotional indicators.

* Following the principle of normal distribution, out of 100 stimulus words included in Kent-Rosenoff word association test, 68 stimulus words of average response entropy value were selected. 16 high response entropy value stimulus words and 16 low response entropy stimulus words were eliminated to select only those stimulus words which have average response entropy value. This was done in view of the findings revealing significant relationship between response entropy value of stimulus word and word association emotional indicators. The results are discussed meaningfully in the next chapter. These findings suggest that response entropy of the stimulus word is an important interfering variable and the genuineness of word association emotional indicators as indices of emotionality can not be understood properly without due regard to response entropy.

** (i) repetition of stimulus before responding, (ii) unique response, (iii) long reaction time, (iv) response repetition, (v) moderately infrequent response, (vi) less common response, (vii) common response, (viii) misremembering, and (ix) forgetting. Stimulus repetition occurred too infrequently to permit statistical analysis. It was ignored.
Furthermore, the identified word association emotional indicators located in the word association test responses were also used to find out the joint occurrence of the following combinations of emotional indicators.*

(i) repetition of stimulus before responding, unique response;
(ii) repetition of stimulus before responding, long reaction time;
(iii) repetition of stimulus before responding, response repetition;
(iv) repetition of stimulus before responding, misremembering;
(v) repetition of stimulus before responding, forgetting;
(vi) unique response, long reaction time;
(vii) unique response, response repetition;
(viii) unique response, misremembering;
(ix) unique response, forgetting;
(x) long reaction time, response repetition;
(xi) long reaction time, misremembering;
(xii) long reaction time, forgetting;
(xiii) response repetition, misremembering; and
(xiv) response repetition, forgetting.

For each subject, the frequencies of joint occurrence of the above mentioned combinations of emotional indicators were counted. A frequency occurring in any of the combinations *Forgetting and misremembering, of course, are mutually incompatible, and cannot co-occur.*
of emotional indicators was given a score of 1.

The total score for each subject with respect to each combination was obtained by adding up his categorized combinations of emotional indicators over the whole test. Out of these fourteen combinations, the last combination (response repetition and forgetting) occurred too infrequently to permit statistical analysis and was ignored in the main analysis.

In addition, the identified word association emotional indicators were also used to find out the occurrence of three emotional indicators together at the same place and for the same stimulus word. For each subject, the frequencies of occurrence of three emotional indicators together for the same stimulus word were counted. A frequency occurring in any of the following combinations of word association emotional indicators was given a score of 1:

(i) repetition of stimulus before responding, unique response and long reaction time;
(ii) repetition of stimulus before responding, long reaction time and response repetition;
(iii) unique response, long reaction time and response repetition;
(iv) unique response, long reaction time and misremembering;
(v) unique response, long reaction time and forgetting;
(vi) repetition of stimulus before responding, long reaction time and misremembering;
(vii) repetition of stimulus before responding, long reaction time and forgetting;
(viii) repetition of stimulus before responding, unique response and forgetting;
(ix) repetition of stimulus before responding, unique response and response repetition;
(x) repetition of stimulus before responding, unique response and misremembering;
(xi) repetition of stimulus before responding, response repetition and misremembering;
(xii) repetition of stimulus before responding, response repetition and forgetting;
(xiii) unique response, response repetition and misremembering;
(xiv) unique response, response repetition and forgetting;
(xv) long reaction time, response repetition and misremembering; and
(xvi) long reaction time, response repetition and forgetting.

The total score for each subject with respect to each combination was obtained by adding up his categorized combinations of emotional indicators over the whole test. Out of these sixteen combinations, the first seven combinations of three emotional indicators were retained for the main analysis. The remaining nine combinations occurred too infrequently
to permit statistical analysis and were ignored in the main analysis.

For each subject the scores on psychometric measures of anxiety, psychoticism, neuroticism, extraversion, psychopathic deviation and verbal and figural creativity were also obtained. Anxiety scale questionnaire provided composite anxiety score and separate scores on five different components. Eysenck personality questionnaire provided four different measures pertaining to psychoticism, neuroticism, extraversion and dissimulation. Verbal and figural forms of creativity provided seven measures concerning creativity. Out of these seven measures, three measures pertained to verbal creativity and four measures were related to figural creativity. The measure of psychopathic deviation was also obtained for each subject.

In brief, the following measures were obtained as a result of administering different tests:

(i) response entropy value of each stimulus word;
(ii) scores for each "stimulus word" of the Kent-Rosanoff word association test on seven categorized emotional indicators;
(iii) scores for each subject on different emotional indicators;
(iv) scores for each subject on thirteen different combinations of two emotional indicators occurring jointly;
(v) scores for each subject on seven different combinations of three emotional indicators occurring together for the same stimulus word; and

(vi) scores for each subject on psychometric measures of anxiety, neuroticism, psychoticism, extraversion, psychopathic deviation and verbal and figural creativity. The measure of second-order anxiety factor was scored for the total as well as five subtests.

From the above information four separate analyses were done:

Analysis I

In the first analysis, the relationship of response entropy with emotional indicators was studied by computing correlations. For this purpose the following measures were used:

(i) response entropy value of each stimulus word; and

(ii) scores for each stimulus word on seven categorized* emotional indicators.

Analysis II

In the second analysis, the relationship of single emotional indicators with psychometric measures of anxiety,

* The reasons for excluding "less common" and "common" word associations in analysis I are given at pages 82-83.
neuroticism, psychoticism, extraversion, psychopathic deviation and creativity was studied. This was done to find out which single indicator provides the best evidence of emotional disturbance. For this purpose factor analysis was applied to the following set of scores:

(i) scores for each subject on nine emotional indicators; and
(ii) scores for each subject pertaining to second-order anxiety factor, components of anxiety, psychoticism, neuroticism, extraversion, psychopathic deviation and creativity.

**Analysis III**

This analysis was done to see whether two emotional indicators occurring jointly provide better criteria for emotional disturbance than single indicators? This was done by computing correlations among the following set of scores:

(i) scores for each subject on thirteen different combinations of two emotional indicators occurring together for the same stimulus word; and
(ii) scores for each subject pertaining to second-order anxiety factor, components of anxiety, psychoticism, neuroticism, extraversion, psychopathic deviation and creativity (verbal and figural).

**Analysis IV**

In the fourth analysis, the relationship of three emotional indicators (occurring together for the same stimulus
(word) with psychometric measures of anxiety, neuroticism, psychoticism, extraversion, psychopathic deviation and creativity was studied by computing correlations. This was done to find out whether three emotional indicators occurring together for the same stimulus word provide better criteria for emotional disturbance than pairs of emotional indicators occurring together or single indicators. For this purpose the following measures were used:

(i) scores of each subject's on seven different combinations of three emotional indicators occurring together for the same stimulus word; and

(ii) scores of each subject pertaining to second-order anxiety factor, components of anxiety, psychoticism, neuroticism, extraversion, psychopathic deviation and creativity (verbal and figural).

It can be noted that in the last three analyses to be done separately, only the scores on the occurrence of emotional indicators differ, while the scores on psychometric measures of anxiety, neuroticism, psychoticism, extraversion, psychopathic deviation and creativity remain the same.