METHODOLOGY

The present study is aimed at the exploration of different personality dimensions and cognitive factors responsible for creativity. The aim has been achieved by collecting data for the purposed study with the application of different psychological tests and then, finally applying necessary and appropriate statistical techniques. The chapter has been organised under following titles:

1. Sample
2. Psychological tests
3. Statistical techniques
4. Summary of the variables with abbreviations used in this study

3.1 SAMPLE

A sample size of 200 subjects ranging between the age group of 20-25 years, all students (both male and female) of G.N.D.U., Amritsar have been selected for the purpose of the present study and the data obtained were divided into high-low groups for novelty type of creativity and meaning type of creativity, using quartile method. First and third quartiles were selected for the respective purposes. Convenient sampling techniques have been employed for the purpose.

3.2 PSYCHOLOGICAL TESTS

a) Torrance Test of Creative Thinking (figural part only) (Torrance, 1961)
b) NEO-Five Factor Inventory (NEO-FFI) (Costa and McCrae, 1989)
c) Embedded Figures Test, the short form of Witkin’s embedded figures test (Jackson, 1956).
d) Rorschach Ink-Blot Test (Rorschach, 1921).

3.2. a) Torrance Test of Creative Thinking Figural (Torrance, 1961)

In the domain of creativity as a field of research, Torrance’s test battery for assessing creative potential of the individual has attained wide popularity. It comprises seven verbal and three figural tests or better (active) but for the present
study only the three figural activities were used as a measure of ‘Novelty’ type of creativity. The three activities in the figural tasks of this test are picture construction, picture completion and parallel lines.

The Picture construction activity requires the subjects to draw something clear and unusual using a given egg shaped piece of paper as the basis for his/her picture within 10 minutes. The Picture completion activity presents the test taken with a variety of abstract lines or designed which he/she is to sketch into unusual picture or objects. There are 10 abstract designs which the subject has to complete within 10 minutes.

The Parallel lines activity is similar to picture completion activity except that here the subject is to draw pictures on similar pairs of straight lines.

Although the basis of activities differs, each is scored for fluency, flexibility, originality & elaboration. On the assumption that one can engage in the range of problem solving activities either creatively or un-creatively.

- The number of relevant response produced by a subject yield the measure of fluency.
- The numbers of different categories of questions, causes, consequences, products or uses give a measure of flexibility.
- The statistical infrequency of those responses based on earlier research is the measure of originality, and
- The number of embellishments on response provides score on elaboration.

The test retest reliability of the Torrance tests, for time intervals of one week to eight months, range from 0.34 to 0.97 (Guralaski, 1964 and Eherts, 1961). In Indian settings the tests also have been found to be highly reliable (Gokher & Luthra, 1973, Minhas, 1983). Kaur (2010) have also successfully used Torrance Test of Creative Thinking (figures only) in Indian settings.

3.2.b) Neo- Five Factor Inventory (Costa and McCrae, 1989, 1992)

The Neo Five Factor Personality Inventory (NEO-FFPI) had been developed to measure the five major dimensions of personality and some of the more important trait facets defining the dimensions (Costa and McCrae, 1989), now it has been replaced by NEO- Five Factor Inventory (Costa and McCrae, 1992) which is a
A concise measure of five broad dimensions of personality. As appeared in 1985, the NEO-PI had well analyzed scales for the facets of Neuroticism (N), Extraversion (E), and Openness (O), but only global scales to measure Agreeableness (A) and Conscientiousness (C). Several enhancements of the NEO-PI were offered to the users in 1989, but the inventory itself remains unchanged.

The NEO-PI-R completes the development of instruments by adding the A and C facet scales that were implicitly premised by the NEO-PI/NEO-FFI professional manual (Costa and McCrae, 1992). Additionally, to allow more accurate measurement of several of their facets, ten of the original N, E, and O items were replaced in the NEO-PI-R. This manual simultaneously provides information on the NEO Five Factor Inventory (NEO-FFI), a 60 items version of the NEO-PI-R that is scored for the five domains only. The NEO-FFI is useful global measures of personality and is considered sufficient to serve the purpose. The five domains covered by NEO-FFI can be described as follows:

**DESCRIPTION OF THE NEO-FIVE FACTOR INVENTORY SCALE**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroticism (N)</td>
<td>The general embarrassment, anger, guilt, disgust anxiety, worrying, sadness, and upset ability are the core elements of neuroticism, and is the opposite pole of emotional stability.</td>
</tr>
<tr>
<td>Extraversion (E)</td>
<td>Extraverts are sociable, but sociability is only one of the traits that comprise the domain of extraversion. Extraverts like people and prefer large group and gathering, and are assertive, active, energetic, optimistic and talkative. They like excitement stimulation and tend to be cheerful in disposition.</td>
</tr>
<tr>
<td>Openness (O)</td>
<td>Openness to experience is much less known than N or E as a major dimension of personality. The elements of active imagination, aesthetic sensitivity, and attentiveness to inner fallings, preference for variety, intellectual curiosity, originality, and ingenuity and independence of judgment have often played a role in theories and measures of personality, but there is coherence in a single broad domain has seldom been recognized.</td>
</tr>
</tbody>
</table>
Like extraversion, agreeableness is a primary dimension of interpersonal tendencies. The agreeable person is fundamentally altruistic. He or she is sympathetic to others and eager to help them means good natured and cooperative and believes that others will be equally helpful in return. On the other hand, the disagreeable or antagonistic person is egocentric, skeptical of other’s intentions and competitive rather than cooperative.

Many of the theoretical approaches to personality, particularly psychodynamic theory, concern the control of impulses. During the course of development most individuals learn to manage their desires, and the inability to resist impulses and temptations is generally a sign of high neuroticism among adults; and individual differences in this tendency are the basis of conscientiousness. It has characteristics of orderliness, responsibility and dependability.

The Five scales have been assessed for internal consistencies and test-retest reliability. The alpha coefficients for the individual facet scale ranged from 0.56 to 0.81. The full scale coefficient alphas ranged from 86 and 95 (Costa et al., 1990). Other studies using the NEO-PI have reported very similar values for the samples of clinical cases and college students with test-retest reliability (with three months interval) of NEO-FFI scales were obtained from a college sample, and the coefficients were found to .79, .79, .80, .75 and .83 for N, E, O, A and C scales respectively.

The construct validity of five scales was calculated through Factor Analysis, and it was also asserted through external evidence. Johan (1989) provide a strong evidence of convergent and discriminate validity of all five scales. Many other studies (Goldberg, 1989; Ostendorf, 1990) demonstrated strong correlation between their adjective measures and NEO-PI scales.
The tests were scored strictly according to the procedures mentioned in respective manuals by using separate keys or scoring instructions. The NEO-FFI is scored for five dimensions. Some items of NEO-FFI are positively scored and some items are negatively scored. The positively scored items are assigned 0, 1, 2, 3, 4 scores and negatively scored items are assigned scores in reverse i.e. 4, 3, 2, 1, 0. The total scores for each dimension are between 0 to 48.

3.2.c) The Embedded Figures Test (EFT)

(The short form of Witkin’s embedded figures test, Jackson, 1956)

The embedded figures test was initially developed by Witkin (1950) for the assessment of field dependent – independent cognitive styles. The test is perceptual in nature and consists of eight simple figures (A, B, C, D, E, F, G, and H) and 24 complex figures. All are coloured except one named as A – 2. The test basically requires the subject to trace the simple figure as it is embedded in the complex design. The simple figure is shown to the subject for 15 seconds and maximum five minutes are given to disembembed (trace or locate) the same from the complex design. Total time taken to discover all the simple figures determines the subject’s score on field – dependence – independence. Rapid solution – time – scores with the designs are reported as indices of field – independence.

The test has high reliability as shown by odd – even correlations of .87 for men and .74 for women in an American sample. Witkin (1971) reported split – half reliabilities ranging from .92 to .97. In an intensive study of EFT on an Indian sample, Pande (1970) found the split – half reliabilities for male and female samples to be .76 and .81 respectively. Sinha (1979) fruitfully adopted the EFT to Indian setting and has demonstrated its reliability and validity for assessing field – dependent and field – dependent cognitive styles.

The original version of EFT as developed by Witkin is relatively lengthy and time consuming. Jackson (1956) in an attempt to reduce the length of the test has evolved a shorter form of EFT, which consists of 12- complex items (A – 2, A – 3, C-1, C – 2, C – 3, D – 1, D – 2, E – 1, E – 3, E -5, G – 1, & H - 1) only. The time for
presentation of the simple figure is 10 seconds, while only three minutes are allowed for disembedding the simple figure from complex design.

Even though the numbers of items in the short form of EFT have been reduced and the test time limit has been shortened it highly and positively correlates (0.95 to 0.97) with Witkin’s original EFT (Spotts & Mackler, 1967). The short form of the EFT also has a fairly high reliability as shown by odd–even correlations of 0.87 for men and 0.74 for women in an American sample (Witkin et al., 1971) and test–retest reliability of 0.92 (Dana & Goocher, 1959).

Minhas & Kaur (1983) found test–retest reliability 0.70 and split–half reliability to be 0.72 for Jackson’s shorter form of EFT. Chatterjee and Paul (1980) also reveal that the shorter form of EFT a reliable and economical measure of field–dependence and field-independence. Fuljeet (1981) found split – half reliability of 0.73 and a test–retest reliability of 0.71 for Jackson’s shorter form of EFT. Kaur (2010) has also successfully used the Jackson’s shorter form of EFT in Indian settings.

3.2.d) Rorschach Ink-Blot Test

Rorschach ink-blots test is a well-known and widely used projective test. The test has been named after the Swiss psychologist Hermann Rorschach who developed the test in 1921. He started experimentation with ink-blots as a means of stimulating and testing imagination. The test consists of 10 cards on each of which is one bisymmetrical inkblot. Five are in black and white with differently shaded areas. Two contain black, white and colour in varying amounts; three are multicoloured. The test is administered in two phases: in the first the subject responds about which aspects of the ink-blot initiated the response- whole card, parts of the card, small details, location, colour, apparent movement all of these are important for scoring purpose. The second phase is the inquiry that gives the subject an opportunity to add to or clarify his responses and the clarification should be spontaneous on the part of the subject and without any suggestion from the examiner. The various aspects of the subject’s behaviour to be noted by the researcher: the responses of the subject are noted as verbatim so far as possible, reaction time, length of time in long pauses,
total time required, position of card, body language of the subject at the time of experimentation.

In fact, there is no time limit and limit of responses, the subject is free to take as much time as he wants and can give as many as responses he wants.

Scoring

- Location- the first is the location or area which has been perceived as the basis of the response: whole picture (W), big portion means common details (D), and small, unusual details (Dd), white space (S).
- Determinants-this includes the characteristics of the ink-blot responsible for the response and these are: form (F), shading (K), colour (C), perspective or depth (Fk) and motion (M) or combination of them.
- Content-the classification of responses into more common groups such as plants, animals, humans, landscapes, man-made objects, anatomy, sex and others.
- Originals and populars—originals mean those responses which are uncommon and popular means those responses which are common.

In the present study, only movement and whole or good form responses have been used. Movement responses have been used to assess the meaning type of creativity as suggested by Stark (1965), and whole responses have been used for the assessment of intelligence. According to Stark (1966) Rorschach movement responses are interpretive of primary process thinking, and primary process thinking is a phenomenon of everyday life. Movement response is a measure of meaning type of creativity. The novelty context of creativity is aroused by the ‘original’ response in the Rorschach test, i.e., by a response which if followed by Rorschach (1949) himself, occurs but once in 100 tests. The present study uses movement responses of Rorschach ink-blot test only i.e., meaning type of creativity the reason being the tediousness of the scoring for originality score and the availability of other psychometric tests to assess novelty type of creativity.

Scoring

Scoring is done by calculating percentage of movement responses (M) from total number of responses given by the subject.
And for scoring intelligence the percentage of whole responses (W) has been calculated from total number of responses given by the subject.

Jones (1988) using Pearson Product-moment found positive correlation between Rorschach movement responses and Torrance for fluency at 0.925; flexibility, 0.875; and originality, 0.920. Scores for males and females were not found to differ significantly. Gupta et al., (1992) and Jacob et al., (2002) successfully used the Rorschach test in Indian settings. Raychaudhuri (1971) found significant relationship between Rorschach movement (M) score and creativity in Indian settings and there were no significant differences on the same between males and females.

3.3 STATISTICAL TECHNIQUES USED FOR ANALYSIS OF THE DATA

The tabulation of the data collected have been done for the various personality and cognitive variables used in the present study viz., neuroticism, extraversion, openness, agreeableness, conscientiousness, field-dependent-independent cognitive styles, intelligence, (originality, fluency, flexibility, elaboration) novelty type of creativity and meaning type of creativity.

- The frequency distributions, means (M), standard deviation (SD), kurtosis (Ku), and skewness (Sk) have been computed.
- The data were subjected to t-ratio to find the significant difference between means of the various variables used in the study on high-low novelty and meaning types of creativity.
- Discriminant function analyses were computed to find which variables predict high and low novelty and meaning types of creativity.
- The data were subjected to multiple correlation to find correlations between variables, and
- Principal component factor analysis has been applied to find out the correlations amongst various variables.
### 3.4 SUMMARY OF THE VARIABLES USED IN THE STUDY ALONG WITH THEIR ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Variable</th>
</tr>
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<tbody>
<tr>
<td>N</td>
<td>Neuroticism</td>
</tr>
<tr>
<td>E</td>
<td>Extraversion</td>
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<tr>
<td>O</td>
<td>Openness</td>
</tr>
<tr>
<td>A</td>
<td>Agreeableness</td>
</tr>
<tr>
<td>C</td>
<td>Conscientiousness</td>
</tr>
<tr>
<td>Org</td>
<td>Originality</td>
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<tr>
<td>Flu</td>
<td>Fluency</td>
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<tr>
<td>Flx</td>
<td>Flexibility</td>
</tr>
<tr>
<td>Elab</td>
<td>Elaboration</td>
</tr>
<tr>
<td>Int</td>
<td>Intelligence</td>
</tr>
<tr>
<td>F-DI</td>
<td>Field-Dependence-Independence</td>
</tr>
<tr>
<td>MTC</td>
<td>Meaning Type of Creativity</td>
</tr>
<tr>
<td>NTC</td>
<td>Novelty Type of Creativity</td>
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</tbody>
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