Methodology

Research is a logical and systematic search for new and useful information on a particular topic. It is an investigation of finding solutions to scientific and social problems through objective and systematic analyses. It is a search for knowledge that is a discovery of hidden truths.

Research methodology is a systematic way to solve a problem. It is a science of studying how research is to be carried out. Essentially, the procedures by which researchers go about their work of describing, explaining and predicting phenomena are called research methodology. It is also defined as the study of methods by which knowledge is gained. Its aim is to give the work plan of research (Rajasekar, Philominathan and Chinnathambi, 2006).

In research we do not haphazardly make observation of any or all kinds but rather attention is directed towards those observations that we believe to be relevant to the question we have previously formulated. Hence, the objectives of research, as recognized by all sciences, is to use observation as a basis for answering questions of interest, which is contingent upon research methodology. Therefore, scientific precision and reliability of result in any study largely depends upon the efficacy and suitability of the strategy adopted for investigation.

In every scientific research, methodology plays a leading role. In carrying out any research, it is necessary to carefully adopt appropriate research design, selecting standardized tools, choosing appropriate sample through appropriate sampling techniques, undertaking sound procedures for collecting data, tabulating them and analyzing the data by running suitable statistics.
As mentioned in the previous chapters the present research was initiated to study “implicit and explicit mood-congruent memory with conceptually driven and perceptually driven tests under depressed, elated and neutral moods in relation to cognitive rigidity-flexibility”.

**Objectives:**

Keeping in mind the literature reviewed, certain objectives were formulated-

1. To see mood-congruent memory bias in implicit memory under depressed and elated mood conditions.

2. To see mood-congruent memory bias in explicit memory under depressed and elated mood conditions.

3. To see mood-congruent memory bias with conceptually driven test in implicit memory among depressed and elated subjects.

4. To see mood-congruent memory bias with conceptually driven test in implicit memory among rigid and flexible subjects.

5. To see mood-congruent memory bias with perceptually driven test in implicit memory among depressed and elated subjects.

6. To see mood-congruent memory bias with perceptually driven test in implicit memory among rigid and flexible subjects.
7. To see mood-congruent memory bias with conceptually driven test in explicit memory among depressed and elated subjects.

8. To see mood-congruent memory bias with conceptually driven test in explicit memory among rigid and flexible subjects.

9. To see mood-congruent memory bias with perceptually driven test in explicit memory among depressed and elated subjects
10. To see mood-congruent memory bias with perceptually driven test in explicit memory among rigid and flexible subjects.

11. To investigate the effect of type of tests (conceptually-driven and perceptually driven) on implicit memory.

12. To investigate the effect of mood (depressed, elated and neutral) on implicit memory.

13. To investigate the effect of cognitive rigidity-flexibility on implicit memory.

14. To examine interactional effect of type of tests and mood on implicit memory.

15. To examine interactional effect of type of tests and cognitive rigidity-flexibility on implicit memory.

16. To examine interactional effect of mood and cognitive rigidity-flexibility on implicit memory.

17. To examine interactional effect among type of tests, mood and cognitive rigidity-flexibility on implicit memory.

18. To investigate the effect of type of tests (conceptually-driven and perceptually driven) on explicit memory.

19. To investigate the effect of mood (depressed, elated and neutral) on explicit memory.

20. To investigate the effect of cognitive rigidity-flexibility on explicit memory.

21. To examine interactional effect of type of tests and mood on explicit memory.
22. To examine interactional effect of type of tests and cognitive rigidity-flexibility on explicit memory.

23. To examine interactional effect of mood and cognitive rigidity-flexibility on explicit memory.
To examine interactional effect among type of tests, mood and cognitive rigidity-flexibility on explicit memory.

**Research Questions:**

To be more specific the present research was designed to answer the following questions-

1. Does mood-congruent memory bias occur in implicit memory under depressed and elated mood condition?

2. Does mood-congruent memory bias occur in explicit memory under depressed and elated mood condition?

3. Does mood-congruent memory bias occur in implicit memory with conceptually driven test among depressed and elated subjects?

4. Does mood-congruent memory bias occur in implicit memory with conceptually driven test among rigid and flexible subjects?

5. Does mood-congruent memory bias occur in implicit memory with perceptually driven test among depressed and elated subjects?

6. Does mood-congruent memory bias occur in implicit memory with perceptually driven test among rigid and flexible subjects?

7. Does mood-congruent memory bias occur in explicit memory with conceptually driven test among
depressed and elated subjects?

8. Does mood-congruent memory bias occur in explicit memory with conceptually driven test among rigid and flexible subjects?

9. Does mood-congruent memory bias occur in explicit memory with perceptually driven test among depressed and elated subjects?

10. Does mood-congruent memory bias occur in explicit memory with perceptually driven test among rigid and flexible subjects?
In addition to these questions, the investigator was also interested to seek the answer of the following questions-

1. Does type of test (conceptually driven and perceptually driven) differentially affect implicit memory?

2. Does different shade of mood (depressed, elated and neutral) has differential effect on implicit memory?

3. Does cognitive rigidity-flexibility have differential effect in implicit memory?

4. Is there any interactional effect of type of tests and mood on implicit memory?

5. Is there any interactional effect of type of tests and cognitive rigidity-flexibility on implicit memory?

6. Is there any interactional effect of mood and cognitive rigidity-flexibility on implicit memory?

7. Is there any interactional effect among type of tests, mood and cognitive rigidity-flexibility on implicit memory?

8. Does type of test (conceptually driven and perceptually driven) differentially affect explicit memory?

9. Does different shade of mood (depressed, elated and neutral) has differential effect on explicit memory?

10. Does cognitive rigidity-flexibility have differential effect in explicit memory?

11. Is there any interactional effect of type of tests and mood on explicit memory?

12. Is there any interactional effect of type of tests and cognitive rigidity-flexibility on explicit memory?
13. Is there any interactional effect of mood and cognitive rigidity-flexibility on explicit memory?
14. Is there any interactional effect among type of tests, mood and cognitive rigidity-flexibility on explicit memory?

Design of the Study:

For a scientific research one has to prepare a research design. It should indicate various approaches to be used in solving the research problem, sources and information related to the problem and time frame and the cost budget. Essentially, the research design creates the foundation of the entire research work. The design will help perform the chosen task easily and in a systematic way. Once the research design is completed the actual work can be initiated.

In the present research 2X3X2 (Tests: Conceptually Driven, Perceptually Driven X Types of Mood: Depressed, Elated, Neutral X Cognition: Rigidity, Flexibility) factorial design was used. According to Kerlinger (1973), “factorial design is the structure of research in which two or more independent variables are analyzed in order to study their independent and interactive effects on a dependent variable”.

In order to answer the above mentioned questions a 2X3X2 factorial design was used. In which one stimulus variable (type of tests) and two personality variables (mood and cognitive rigidity-flexibility) were used in the present research. The first stimulus variable i.e. type of tests was varied in two ways a) conceptually driven and b) perceptually driven test. The one personality variable i.e. mood was varied in three ways a) depressed mood, b)
elated mood and c) neutral mood. Similarly the second personality variable i.e. cognitive style was varied in two ways a) cognitive rigidity and b) cognitive flexibility. Thus there were 12 groups of subjects and each was tested for mood congruent memory bias in implicit and explicit memory.
There were 12 groups of subjects as given below:

- **Group I** - Depressed-Conceptually driven test-Rigid.
- **Group II** - Depressed-Conceptually driven test-Flexible.
- **Group III** - Depressed-Perceptually driven test-Rigid.
- **Group IV** - Depressed-Perceptually driven test-Flexible.
- **Group V** - Elated-Conceptually driven test-Rigid.
- **Group VI** - Elated-Conceptually driven test-Flexible.
- **Group VII** - Elated-Perceptually driven test-Rigid.
- **Group VIII** - Elated-Perceptually driven test-Flexible.
- **Group IX** - Neutral-Conceptually driven test-Rigid.
- **Group X** - Neutral-Conceptually driven test-Flexible.
- **Group XI** - Neutral-Perceptually driven test-Rigid.
- **Group XII** - Neutral-Perceptually driven test-Flexible.
Table 1: Showing the Design of the Experiment Diagrammatically.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mood Inducement Stimulus Material</th>
<th>Presentation</th>
<th>Retention Interval</th>
<th>Measurement of Implicit Memory</th>
<th>Measurement of Explicit Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressed-Conceptually driven test-Rigid.</td>
<td>Mood inducement among the subjects through MVMIT.</td>
<td>The list of words was presented in random order.</td>
<td>A distraction task (block designing) was given for 5 minutes to fill up retention interval.</td>
<td>Stem completion (perceptually driven) or free association (conceptually driven) was used.</td>
<td>Stem cued recall (perceptually driven) or Cued recall (conceptually driven) was used.</td>
</tr>
<tr>
<td>Depressed-Conceptually driven test-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressed-Perceptually driven test-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexible.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rigid.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressed-Perceptually driven test- Flexible.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elated-Conceptually driven test- Rigid.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elated-Conceptually driven test-</td>
<td>Flexible.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elated-Perceptually driven test-</td>
<td>Rigid.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elated-Perceptually driven test-</td>
<td>Flexible.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral-Conceptually driven test-</td>
<td>Rigid.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conceptually</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>driven test-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexible.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral -</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceptually</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>driven test-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rigid.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Sample:

Sample is a set of individuals selected from a population, usually intended to present the population in a research study. Kerlinger (1983) pointed out that sample is a portion of a population or universe as to representative of that population or universe. This means that sampling is the process of drawing a small part of the population and
assuming it to be representative characteristics of the whole population. Mohsin (1984) sample is a small part of
total existing events, objects or the information.

In the present research, five hundred students were selected on the basis of simple random sampling. Students
were selected from faculty of social sciences, Aligarh Muslim University, Aligarh, India. Subjects were
classified on the basis of scores obtained on the Rigidity-Flexibility scale. Subjects who obtained scores below
19 were categorized as flexible and subjects who scored more than 25 were categorized as rigid. Final sample
was comprised of 180 subjects i.e. 90 rigid and 90 flexible. All the subjects were male and age range between
16 to 22 years. All subjects were matched on all relevant variables like age, education, vision, hearing, physical
and mental health.

**Tools and Stimulus Material:**

In the present research following tools and stimulus material were used-

1. Rigidity-Flexibility Scale.

2. Modified Velten Mood Induction Technique (MVMIT).

3. List of Words.


**Rigidity-Flexibility Scale:**

English version of rigidity-flexibility scale (RFS) developed by Ansari and Bhargava (1987) was used to
measure rigidity-flexibility of the subjects. This scale comprised of 39 items with 2 alternative responses Yes or
No. This scale comprised of 6 components namely, 1) constriction and inhibition, 2) intolerance of disorder and ambiguity, 3) conservatism, 4) obsessional and perseverative tendency, 5) social introversion, 6) anxiety and guilt. The items which measure each of the characteristics are given below-
1) Constriction and Inhibition- 13, 25, 28.

2) Intolerance of Disorder and Ambiguity- 14, 15, 16, 17, 20, 27, 37.

3) Conservatism- 19, 22, 23, 24, 34, 35.

4) Obsessional and Perseverative Tendency- 8, 18, 21, 36, 39.

5) Social Introversion- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 26, 29, 33.

6) Anxiety and Guilt- 12, 3, 31, 32, 38.

Scoring was done according to manual. The reliability of rigidity scale was estimated by split-half technique, which is 0.72 and validity is 0.82.

Following instructions were given to the subjects to measure rigidity-flexibility of the subjects-

‘Following are some statements related to your thinking, behavior, experience and attitude. There are two alternative response ‘Yes’ or ‘No’ in each of the statements. The answer of these statement may be either of these two responses ‘Yes’ or ‘No’. Please read out all the statements carefully and put a tick (✓) either of these responses which suit your taste. You will have to answer all the statements without leaving any of the statements. Remember, there is no right or wrong answer of these questions’.

Thereafter, the raw scores on the scale were converted into Z scores. Subjects, whose scores fell below Q1, i.e. below 19, were identified as flexible and whose scores fell above Q3, i.e. 25 were categorized as rigid subjects.

**Modified Velten Mood Induction Technique (MVMIT):**

Originally this technique was developed by Velten (1968) but Sinclair (1994) modified this technique to make it
more effective. This modified technique enhanced the duration of mood as compared to original Velten
technique, with the inclusion of an incubation period leading to mood change lasting up to 35 minutes. Further
this MVMIT resulted in mood differences, even after various intervening tasks.
This mood induction technique consisted of mood relating statements. There were 60 depressed statements, 60 happy (elated) statements and 60 neutral statements. The depression related statements contained in MVMIT were of two types: statements regarding self devaluation and statements concerning somatic states that were associated with depression like, I am doubted that I am a worthwhile person”, “I feel rather sluggish now”. The happy statements like,”I feel cheerful and lively” and “I have a sense of power and vigor” were related with positive mood as joy, happiness and elation. Neutral statements like “The doorkeeper was dressed in red “and “The review is concerned with the first three volumes” were related with neutral mood For inducing a particular mood among subjects the following instructions were given to them-

“You will be shown a series of slides with statements written on them. These statements will represent a certain mood and your success will be largely a question of your willingness to be receptive and responsive to the idea in each statement. Allow each idea to act on you without interference. First, as you go through the slides, you should simply read each statement to yourself. You should concentrate on it and feel it with intended seriousness. Then you are required to go over each statement again and again in your head with the determination and willingness to really believe it. You should experience each idea. You should concentrate your full attention on it. You should exclude other ideas which are unrelated to the mood so respond to the feeling suggested by each item. You should think of yourself with as much clarity and realism as possible, as definitely being and moving into that mood state”.

After reading these instructions, subjects were started reading the mood related statements from one category
(depressed, elated and neutral). After reading the entire 60 mood related statements of one category, subjects were asked to read the incubation
instructions of concerned category to enhance the duration of mood state. In this way a particular mood was induced among the subjects.

List of Words:

A list of 16 words was used, half of them were positively charged words such as Happiness, Delighted (positive words) and remaining half were negatively charged words such as Embarrass, Miserable (negative words). There were 8 positively charged words and 8 negatively charged words. These positive and negative words were prepared by conducting a pilot study. The positive and negative words were roughly equivalent in length and frequency. These words were randomly arranged in the list. Each word was presented in green, 80, Times New Roman font size. The words were presented one at a time, in the center of white screen for 4 seconds.

In order to prepare a list of eight positive (happy) and eight negative (sad) words, a pilot study was carried out. In this study a group of 100 subjects participated. These 100 subjects were given a sheet of paper and pencil and were requested to write down as many positive and negative words within 30 minutes. After 30 minutes the paper sheets were collected and positive and negative words tabulated to find out the frequency of occurrence for both positive and negative words. Only those positive and negative words were selected for the study whose frequency of occurrence ranged from 70 percent to 100 percent and which had more or less equal number of letters. By this procedure following eight positive and eight negative words were selected and were used in the present study.
List of Words (Positive and Negative):

Delighted
Dizziness
Adversity
Enjoyment
Uncertain
Happiness
Hostility
Stressful
Refreshed
Embarrass
Repentance
Affection
Confident
Ambitious
Sweetness
Miserable

Tests:

Four tests were used in order to measure implicit and explicit memory of the subjects. Two were conceptually driven tests and two were perceptually driven tests.

1. Conceptually Driven Tests: As stated in the previous chapter conceptually driven tests require participants to activate conceptual processes to complete the task. If a test requires the participants to attend to the meaning of test cues, it is said to be conceptually driven test. Conceptually driven tasks rely on the semantic meaning of the study items and less upon perceptual characteristics of the items.
II. Free Association Test (Implicit Memory): In free association test, word “EMOTION” was given to the subjects and subjects were asked to write as many associates of the word “EMOTION” as possible within 4 minutes.

III. Cued Recall Test (Explicit Memory): In cued recall test, word “EMOTION” was given to the subjects and subjects were asked to use word “EMOTION” as a cue and with the help of this cue, they were asked to recall in writing as many items as possible of the previously presented list within 4 minutes.

4. Perceptually Driven Tests: As contrast to the conceptually driven tests in perceptually driven tests cognitive processes of the participants are guided by perceptual feature of the stimuli. Perceptually driven tests challenge the perceptual systems. Perceptually based tasks rely on processing the physical features of the presented stimulus in order to perform the tasks.

V. Stem Completion Test (Implicit Memory): In stem completion test the three letters word stems were given to the subjects and the subjects were asked to complete each word stem with the first word that came to mind first within 4 minutes.

VI. Stem Cued Recall Test (Explicit Memory): in stem cued recall test three letters word stems were given as a cue and subjects were asked to use stem as a cue and with the help of these cues they were asked to recall in writing as many items as possible of the previously presented list within 4 minutes.
Data Collection:

First of all investigator obtained permission from the chairmen of different Departments of Faculty of Social Sciences, Aligarh Muslim University, Aligarh. Investigator randomly selected 500 students from different Departments of Faculty of Social Sciences, Aligarh Muslim University, Aligarh.
Investigator administered rigidity-flexibility scale on 500 students. Instructions were given as mentioned with the rigidity flexibility scale.

When the subjects completed the scale, investigator collected the sheets from the subjects and scoring was done.

Final sample comprised of 180 subjects. Half of them were rigid subjects and half of them were flexible i.e. 90 subjects were rigid and remaining 90 were flexible. All these subjects were called again individually.

**Voluntary Participation, Confidentiality, Anonymity and Withdrawal:**

Investigator established rapport with the subjects and requested them to participate voluntarily and cooperate in the data collection process. Subjects were assured that their responses will be kept strictly confidential and would be utilized for research purpose only. Informed consent was taken from all the subjects. All the subjects participated voluntarily; no one was forced to participate. All the subjects were free to withdraw anytime without any penalty.

All the 180 subjects were tested individually. As the subject enters the laboratory, he was seated comfortably on a chair facing computer monitor. Distance from the monitor was same for all the subjects. For inducing a particular mood among the subjects the following instructions were given-

‘You will be shown a series of slides with statements typed on them. These statements will represent certain mood and your success will be largely a question of your willingness to be receptive and responsive to the idea in each statement. Allow each idea to act on you without interference. You should try to feel that mood. First, as you go through the slides, you should simply read each to yourself. You should concentrate on it with intended
seriousness. Then you are required to go over each statement again and again in your head with the
determination and willingness to really believe it. You should experience each idea. You should concentrate
your full attention
on it. You should exclude other idea which is unrelated to the mood so respond to the feeling suggested by each item. You should then think of yourself with as much clarity and realism as possible, as definitely being and moving into that mood state”.

After these instructions, subject then started reading the mood related statements from one category (depressed, elated or neutral) through the computer monitor. The subjects were also informed to read the statements as quickly as possible but not so fast as to make mistakes. Subject read each statement on the slide and press the “right arrow” key for on the keyboard in order to read another statement on the next slide. After reading all 60 mood related statements of one category, subject was asked to read the incubation instruction slide of the concerned category to enhance the duration of mood state. In this way particular mood was induced in the subject.

After mood inducement, before presenting the list, following instructions were given to him-

“I am going to present you a list of few words one by one through the computer. Each word will appear on the screen for few seconds. You are required to see each word carefully and read aloud. In this way the entire list was presented for 5 trials. Stimulus words were presented in random order in the list. After 5 trials, the subject was exposed to a brief distracter task (block-designing) of 5 min. duration.

Each subject then introduced to test phase. An attempt was made to dissociate study and test. Subject was asked to participate in a developmental experiment and told that we need to develop some material.

Implicit memory was tested by cue association test and stem completion test. Whereas explicit memory was
tested by cued recall and stem cued recall test.
Debriefing:

To neutralize the mood effects (depressed and elated) subject was asked to read neutral mood related statements.

Subject was then debriefed and thanked for his participation in the experiment.

Debriefing included explaining mood-congruent memory, prior findings, the reasoning behind the present study and the design of the present study. The subject was encouraged to ask questions and comment on the design of the study. The subject was asked not to discuss the study with anyone else until the testing phase of the study was finished.

Statistical Analyses:

Statistics provides the strategy and methods for gathering the maximum amount of information for a given expenditure of time and other resources. Once the relevant information is obtained, the researcher requires methods to describe and summarize data so that results are interpretable and communicated (Mendenhall and Ramey, 1973).

The data so obtained was tabulated group wise and analyzed by Statistical Packages for Social Sciences (SPSS 16.0 version) and Multivariate Analyses of Variance (MANOVA) was applied in order to draw necessary inferences. One-Way ANOVA was applied in order to see whether or not mood congruency occurs in implicit and explicit memory under different conditions. An additional statistical analysis was done by applying Three-Way ANOVA in order to see the differential effects of all independent variables on implicit and explicit memory as a whole.