Chapter – IV
Design and Methodology
DESIGN AND METHODOLOGY

In the last chapter it has been highlighted that the objective of the present study was to investigate the effect of learning styles and retrieval facilitation on verbal memory.

DESIGN

A $2 \times 4 \times 4$ factorial design (separate group) using 4 learning styles as described by Kolb and 4 verbal tasks varying in the level of retrieval facilitation as shown in the following figure was employed.

Learning styles

<table>
<thead>
<tr>
<th>Task</th>
<th>Sex</th>
<th>Imaginative</th>
<th>Dynamic</th>
<th>Precision</th>
<th>Analytical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free Recall</td>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serial Recall</td>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Cued Recall</td>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognition</td>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
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<td></td>
</tr>
</tbody>
</table>

$n = 8, N = 256$
SAMPLE

For this experiment a sample of total of 800 (400 males and 400 females) students with an age range 16 to 25 years was selected from various Educational Institutions in Rohtak District. They were given Kolb Learning Style Inventory to select at least 64 Ss belonging to each of the learning styles. A total of 256 subjects (128 males and 128 females) were screened. Now the Ss in each learning style were divided into four groups having 16 Ss each i.e. 8 males and 8 females. These four groups of each learning style were now tested on 4 verbal memory tasks i.e. serial recall, free recall, cued recall and recognition.

TOOLS

1. Kolb’s Learning Style Inventory

It is a measure of learning style. The original version was given by Kolb in 1984. Its Indian adaptation was done by Dangwal and Mitra, in 2000(Appendix A).

Kolb’s Learning Style Inventory has been adapted for the Indian population. The current test consists of 52 items; 26 items measure the Abstract Conceptualization (AC)/Concrete Experience (CE) continuum, and 26 items measure the Active Experimentation (AE)/ Reflective Observation (RO) Continuum. Each tick mark is given a score of 1.
Scores are calculated for the all four modes. The maximum scores on each mode (AC, CE, AE, RO) is 26 and minimum score is 0.

**Reliability**

The overall reliability for the 52 items was found to be Alpha 0.77 which is relatively high. When spilt half Alpha was taken for the 26 items Alpha part 1 was observed to be 0.60 and Alpha part 2 was observed to be 0.66 which was again found to be relatively high.

**Internal Validity:** The validity of the four dimensions was examined; the bipolar dimensions AE/RO and AC/CE, are negatively correlated (r = -1.00, p< 0.01). This means that if an item on AC is high, the same item will be low on the CE dimension and the same applies to AE/RO Continuum. Thus there is high inter dimensional validity.

**External validity:** The external validity of the test was established by testing against the MBTI. The quadrants matched with the four identical dimensions of the MBTI. The dynamic quadrant is negatively correlated with the analytical quadrant. AC/RO and AE/CE are negatively correlated (r = -1.00, p<0.01). Similarly, the precision quadrant is negatively correlated with the imaginative quadrant. CE/RO and AE/AC are significantly negatively correlated (r= -1.00, p<0.01).
The four types of learners as described by Dangwal and Mitra are as follows:

(i) **Diversers/Imaginative Learner**

Imaginative learners are high on CE and RO dimensions. They depend on concrete experience and reflective observation. Their greatest strength lies in their imaginative ability. They perform best in situations where they have to generate ideas. They need to seek background information and sense opportunities, investigate new patterns, recognize discrepancies and problems, and generate alternatives. They have broad cultural interests and tend to specialize in the arts. They are interested in people and tend to be imaginative and emotional. This style is characteristics of people with a background in the humanities and arts.

(ii) **Converger/Precision Learner**

Precision learners are high on AE and AC dimensions. They perceive information abstractly but process it actively. Their greatest strength lies in the practical application of ideas. They seem to do best in those situations, such as conventional intelligence tests, where there is a single correct answer or solution to question or problem. Their knowledge is organized in such a way that through hypothetico-deductive reasoning, they can focus on specific problems. They are seen as
relatively unemotional, preferring to deal with things rather than people. They are pragmatists who seek results. Ideas must have utility; they have little patience for vague and fuzzy ideas. They tend to have narrow interests and often choose to specialize in the physical sciences. This learning style is characteristic of many engineers.

(iii) Assimilator/Analytical Learner

Analytical learners are high on AC and RO dimensions. They perceive information abstractly but process it reflectively. Their greatest strength lies in their ability to create theoretical models. They can assimilate disparate observations into an integrated explanation, which is why they excel in inductive reasoning. They value continuity and sequential thinking and need to seek opinions from experts. They are more interested in abstract concepts than in people. They are less concerned with the practical use of theories and more concerned with whether the theory is logically sound and precise. They like to work in the traditional classroom mode. They seek personal effectiveness as well as goal attainment. Their learning style is more characteristic of the basic sciences and mathematics than applied sciences.
(iv) Accommodator/Dynamic Learner

Dynamic learners are high on AE and CE dimension. They perceive information concretely but process it actively. Their strength lies in doing things; carrying out plans and experiments and getting involved in new experiences. They take more risks than people with the other three learning styles. They excel in situations where they have to adapt to specific circumstances. They tend to solve problems in an intuitive, trial-and-error manner, relying heavily on other people for information rather than their own analytical ability. In situations where the theory or plans do not fit the facts, they are likely to discard the plan or theory. They are at ease with people but are sometimes seen as impatient and “pushy”. Their educational background is often in technical or practical fields, such as business. In organizations, people with this learning style are found in “action-oriented” jobs.

2. Memory Task

Four memory tasks were employed in total. These were selected on the basis of retrieval facilitation i.e. the degree of retrieval of facilitation was varied. The tasks have been described below in order of increasing retrieval facilitation. For all the tasks 15 NSS in each list (CVC, with 40
to 53% association value) were prepared. These items were selected from a list of non-sense syllables which was originally taken from Glaze’s list.

(i) Free Recall

The simplest verbal task is free recall. In this task verbal units, usually words/NSS, are read out or presented visually to S. After all the items, usually 10 to 20 have been presented, S’s task is to write or say as many as he can. The unique feature is that Ss is free to give the items in any order. He is given credit for recalling list items regardless of their order.

A list of 15 NSS was prepared having an association values of 40% to 53% from Glaze’s list. The Ss learnt the task upto 80% of criterion of learning. Retrieval facilitation is not high in this task.

(ii) Serial learning

Operationally serial recall differs from free recall in two major respects. First the order of the items typically is held constant in presentations from trial to trial and items are counted correct only if S recalls them in the same order that they were given. Second an “anticipation” procedure usually is used in serial recall experiments but never in free recall. With this procedure, S is presented with a list of say 8
words. When we sees the first word, he is to respond with (anticipate) the second; when he sees the second he is to respond with the third and so on.

For this a list of 15 NSS having an association values of 40% to 53% was prepared. These items were selected from a list of non-sense syllables which was originally taken from Glaze's list. Eighty% criterion of learning was followed while training the students. In this task the degree of retrieval facilitation is minimum.

(iii) Cued Recall

The greatest opportunity for analysis of verbal recall in general is provided by the paired-associate procedure, and most of the data have been gathered using this technique. This task requires S to produce a verbal unit (stimulus term) with which it previously had appeared.

A list of 15 NSS was prepared having an association values of 40% to 53% was prepared from Glaze's list. The Ss learnt it upto 80% criterion of learning. The task is easier than serial recall and free recall as the cue is presented here for the retrieval facilitation.

(iv) Recognition

In the most general case of recognition S first is exposed to a number of verbal items, then at some later time he is presented with these
original items mixed among new items. The Ss task is to tell whether each item is from the new list or the original one.

The basic material used for these tasks was NSS. A list of 15 NSS having an association values of 40% to 53% was prepared from Glaze’s list. The Ss learnt it upto 80% criterion of learning. It is most easy task because the retrieval facilitation, using cue is maximum here.

3. General Clerical Test

The General Clerical Test (GCT) constructed by Stalnaker in 1936 was used to keep the Ss busy during the retention interval. The test has been designed to measure aptitudes which are of importance in clerical work of all kinds. The nine parts of the test are grouped so as to produce three Subscores as follows:

Clerical Subscore (c): (I) Checking (4') and (II) Alphabetizing (3')

Numerical Subscore (N): (III) Arithmetic Computation (7'), (IV) Error Location (7') and (V) Arithmetic Reasoning (8 ½')

Verbal Subscore (V): (VI) Spelling (4'), (VII) Reading Comprehension (5'), (VIII) Vocabulary (3 ½') and (IX) Grammar (4').

PROCEDURE

After selecting the Ss as mentioned in the sample, the required lists were prepared. Subject was called in the laboratory and he/she was
made comfortable and rapport was established. After this for the serial learning task the following instructions were given to the subject, “This is a memory test. In this test 15 NSS words will be presented to you. Each syllable will be presented only for 2 second. You have to see the words carefully. After the presentation of the whole list you will recall the words in anticipation method. In this method when you see the first word, you respond with the second when you see the second you respond with the third and so on. If you have any doubt you can ask me.” After having confirmed that the procedure was clear to the subject, the subject was made to take seat. Then the memory drum was adjusted. The nonsense syllables were presented to the subject and recall responses were noted down. On each trial correct words were indicated by tick mark (\(\checkmark\)) and incorrect words by cross (\(\times\)). This procedure was continued till the Ss achieved the 80% criterion of learning, i.e., two consecutive recall of 12 correct items out of total 15. After the learning the subjects were kept busy in General Clerical test for filled interval. After the filled activity of one hour the subject was told to recall the words he/she learnt an hour before. And his/her response of retention was noted down.

For free recall, the instructions were given to the subject in the following manner. “This is a memory test. In this a list of 15 nonsense
syllables will be presented to you. You have to see these syllables carefully. Each syllable will be presented only for 2 seconds. After the presentation of the whole list you will have to recall the words you have learnt in any order without being concerned about of the order of presentation”. Same procedure as used in serial recall was repeated again.

In paired recall task the instructions were given to the subject as following manner, “A list of pair of NSS will be shown to you with the help of memory drum. Each syllable will be shown to you only for 2 seconds. You have to see it carefully and learn the list with the pairs. At the time of recall you will be given only one word and you have to recall 2nd item in the pair. If you have any doubt you can ask me now.” The same procedure was repeated as mentioned in the serial recall task. However, after the recall, the actual pair was exposed to the subjects, before showing him/her one word of the pair.

In recognition recall the following instructions were given to the subject, in this a list of 15 NSS words will be shown to you and each word will be shown to you only for 2 seconds. After the first list you will see a second list of 30 NSS. In this list there would be 15 new NSS words and 15 NSS would be old words. You have to recognize the old 15 NSS words which you have seen in the previous list. This procedure will be
continued until you learnt the whole list correctly by trial-by-trial method." After the presentation of the list the responses were noted down carefully.

In all the tasks having obtained the criteria of 80% for each subject, the subject was kept busy performing the General Clerical Test for an hour and retention test was taken. All the scores were now tabulated and subjected to statistical analyses.