

MANONMANIAM SUNDARANAR UNIVERSITY

**DIRECTORATE OF DISTANCE & CONTINUING EDUCATION
TIRUNELVELI 627012, TAMIL NADU**

B.Sc. PSYCHOLOGY - II YEAR

DJP2C - EXPERIMENTAL PSYCHOLOGY
(From the academic year 2016-17)



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DJP2C - EXPERIMENTAL PSYCHOLOGY

Minimum 2 experiments should be chosen from each of the 5 units and in total ten scales should be taken for record writing and practice

Attention

1. Sustained and Focused attention
2. Division of attention
3. Effect of distraction
4. Reaction time

Sensation and Perception

1. Time perception
2. Stroop effect
3. Muller – Lyer Illusion
4. Size – weight illusion.

Learning

1. Habit interference
2. Bilateral Transfer
3. Massed vs. spaced learning
4. Conditioned reflex
5. Paired Associate learning

Memory

1. Effect of meaning on retention
2. Effect of Cueing / priming on recall
3. Effect of Chunking on recall
4. Levels of processing

Thinking

1. Concept formation
2. Syllogistic reasoning
3. Creativity
4. Problem solving apparatus

EXPERIMENTAL PSYCHOLOGY

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UNIT I: ATTENTION

Attention is a topic that has been studied often by cognitive psychologists. It refers to focusing and processing information from our surroundings. While it involves our tending to facets of our environment, the nature of our attention can vary from event to event. There are four main types of attention that we use in our daily lives: selective attention, divided attention, sustained attention, and executive attention.

Types of Attention

Selective attention

Have you ever been at a loud concert or a busy restaurant, and you are trying to listen to the person you are with? While it can be hard to hear every word, you can usually pick up most of the conversation if you're trying hard enough. This is because you are choosing to focus on this one person's voice, as opposed to say, the people speaking around you. **Selective attention** takes place when we block out certain features of our environment and focus on one particular feature, like the conversation you are having with your friend.

Divided attention

Do you ever do two things at once? If you're like most people, you do that a lot. Maybe you talk to a friend on the phone while you're straightening up the house. Nowadays, there are people everywhere texting on their phones while they're spending time with someone. When we are paying attention to two things at once, we are using **divided attention**.

Some instances of divided attention are easier to manage than others. For example, straightening up the home while talking on the phone may not be hard if there's not much of a mess to focus on. Texting while you are trying to talk to someone in front of you, however, is much more difficult. Both age and the degree to which you are accustomed to dividing your attention make a difference in how adept at it you are.

Sustained attention

Are you someone who can work at one task for a long time? If you are, you are good at using **sustained attention**. This happens when we can concentrate on a task, event, or feature in our environment for a prolonged period of time. Think about people you have watched who spend a lot of time working on a project, like painting or even listening intently to another share their story.

Sustained attention is also commonly referred to as one's attention span. It takes place when we can continually focus on one thing happening, rather than losing focus and having to keep bringing it back. People can get better at sustained attention as they practice it.

Executive attention

Do you feel able to focus intently enough to create goals and monitor your progress? If you are inclined to do these things, you are displaying executive attention. **Executive attention** is particularly good at blocking out unimportant features of the environment and attending to what really matters. It is the attention we use when we are making steps toward a particular end.

For example, maybe you need to finish a research project by the end of the day. You might start by making a plan, or you might jump into it and attack different parts of it as they come. You keep track of what you've done, what more you have to do, and how you are progressing. You are focusing on these things in order to reach the goal of a finished research paper. That is using your executive attention.

CHAPTER I: SPAN OF ATTENTION

Introduction:

The term “span of attention” refers to the numbers of object which can be grasped in one short presentation. Sir William Hamilton (1959) was the first to carry experimental study in this field. Later on serial studies were carried on revealing significant facts. Dallerback (1929) studied the span of attention for dots, words, figures and colors of found them to be 8,8,7,9, 3.9 and 3.0 respectively.

Attention is defined as the process which compels the individuals to select some particular stimulus according to his interest and attitude out of the multiplicity of stimuli present in the Environment. Thus, in short it is the selective activity of consciousness as a process of getting an object of thought clearly before the mind.

Span of attention actually tells us that how many things can exist in the focus of consciousness at one time in an individual. The span of Visual apprehension is observed through the instruments named Tachistoscope.

AIM: To determine the span of attention for the following visual stimuli

- i. Single dots
- ii. Grouped dots
- iii. Meaningful words
- iv. Non meaningful words

Materials Required:

1. Tachistoscope – Falling door type
2. 40 meaning cards from 2 to 15 words
3. 15 non meaning cards from 2 to 7 words
4. 17 dotted cards
5. Response sheet

Tachistoscope Apparatus: There are different types of tachistoscopes. **Falling door type** is one which usually has a fixed exposure time. It consists of a wooden screen with a window in the middle which is covered by a movable falling shutter. This falling shutter can be closed or opened with the help of a lever at the top on the back side of the screen. The exposure time is usually $1/10^{\text{th}}$ of a second. This time has been found to allow the subject a good glance at the exposed material and at the same time short enough to prevent him from reading it or memorizing it.

Procedure:

- i. **For the Dotted cards:** The subject is seated in front of the tachistoscope so that he has a good view of the exposure window. The experimenter sits on the other side of the apparatus with the cards.

Instructions: *“Observe the window carefully. I will say ready and open the window. You will see a card with a number of dots. Try to find out how many dots there are. The card will be exposed only for a short time.”*

The experimenter then shuffles the set of cards with single dots and exposes them one after the other, each time giving the ready signal. After presenting each card he makes a note of the actual number of dots as well as the subject's response for that. The complete set is thus exposed and the whole set is repeated second time. Each card is thus exposed twice, and therefore there are 6 stimuli for each level, i.e. 6 exposures for 3 dots, 6 exposures for 4 dots, etc.

After exposing all the cards the experimenter correct them and finds out how many times the subject has responded correctly for each level out of the possible 6 times. The results are tabulated as follows:

Table 1 showing the correct responses made for each level of single and group dots presented

| S. No. | Stimulus Present (Dots) | No. of Correct Responses | % of Correct Response |
|--------|----------------------------|-----------------------------|--------------------------|
| | | | |
| | | | |

Span of Attention for dots is the maximum number of dots to which at least 75 percent of correct responses is made.

- ii. **For the Non-Meaningful Words:** The procedure is the same for non – meaningful words except the instructions: *“In this series you will see certain syllables instead of dots. After seeing each card, write down the syllables as correctly as possible.”*

Table 2 showing the correct responses made for each level of non-meaningful words presented

| S. No. | Stimulus Present (Non-meaningful word) | No. of Correct Responses | % of Correct Response |
|--------|---|-----------------------------|--------------------------|
| | | | |
| | | | |

- iii. **For the Meaningful Words:** The procedure is the same for meaningful words also except the instructions: *“In this series you will find on each card a familiar and meaningful word. Try to write down the word you see on each card as correctly as possible.”*

Table 3 showing the correct responses made for each level of meaningful words presented

| S. No. | Stimulus Present (Non-meaningful word) | No. of Correct Responses | % of Correct Response |
|--------|---|-----------------------------|--------------------------|
| | | | |
| | | | |

Table 4 showing the span of attention in all of the 4 tasks presented

| S. No. | Stimulus Present | Span of Attention |
|--------|----------------------|----------------------|
| 1. | Single Dots | |
| 2. | Grouped Dots | |
| 3. | Non-Meaningful Words | |
| 4. | Meaningful Words | |

Interpretations:

1. From the four stimuli presented, the individual variations in the span of attention for different types of stimuli, can be studied.
2. The span of attention for different stimulus can be compared and seen. Usually there won't be a significant difference between single dots and group dots. This is because of the factor of organization of group of dots as a single stimulus.
3. Similarly, the span of attention for meaningful words will be usually much higher than that of non-meaningful words, which is because of its meaning and familiarity to the meaningful words.

Applications: This concept is widely used in numbering of the automobiles and also in the numbering of customer identifications in voter card, electricity bills, and even in chunking of mobile numbers.

CHAPTER II: DIVISION OF ATTENTION

Aim: To know what happens to attention if two tasks are performed at the same time.

Objective:

- a) To study the method by which two separate physical activities are carried out.
- b) To study the ability of the individual to carry out two separate mental activities.
- c) To find out the ability with which two separate activities, one physical task and one mental task are carried out.

Materials Required:

- 1. Paper & Pencil
- 2. Stop Watch

Procedure of the Experiment:

Series 1: Two physical tasks

The subject is seated comfortably and a sheet of paper and pencil are placed before him / her. Enquiries are made as to find whether the subject is right or left hand dominant. The following instructions are given:

“When I say ready, I want you to draw as many circles as possible with your dominant hand, on the paper. You must stop as soon as I call out stop.”

A time interval of one minute is given for this. The total number of circles drawn is noted by the experimenter.

Next, the subject is asked to draw triangles with his / her non – dominant hand. The following instructions are given for this procedure:

“Now, I want you to draw as many triangles as soon as I call out ready. I want you to stop as soon as I call out stop.”

A time limit of one minute is given for drawing the triangles also. The number of triangles drawn are counted and noted down.

Series 2: Two mental tasks

The subject is seated comfortably and the following instructions are given:

“When I say ready, I want you to recite the alphabets. If you reach z, you have to begin again and continue reciting the alphabets. Stop reciting as soon as I call out stop.”

A time interval of one minute is given for this. The total number of letters recited is noted down by the experimenter.

Next, the subject is asked to recite every third number, beginning with say 1, 4, 7, etc. and the following instructions to be provided:

“Now, I want you to recite every third number, beginning with say 1, 4, 7, etc. and continue reciting the numbers. If you reach 100, begin again from 1 & continue, until I say stop.”

A time period of one minute is given for this and the total numbers recited are counted.

Now, the subject is asked to write the third number beginning with say 1, 4, 7,... and simultaneously, to recite the alternative letter of the alphabets. The following instructions need to be given:

“I want you to recite the alternative alphabet and simultaneously, write the third number, beginning with 1, 4, 7, etc., when I say “start” and you must stop when I say “stop”.

Both the tasks are counted by the experimenter and noted down in the series 2.

Series 3: One physical and one mental task

The following instructions are given to do the physical task.

“When I say ready, I want you to draw triangles with your dominant hand on the paper using pencil. I want you to stop as soon as I call out “stop.”

A time interval of 1 minute is given for this and the total number of triangles drawn is counted.

The subject is then given instructions to do the mental task:

“When I say ready, I want you to recite the alternative letters of the alphabet series. I want you to stop as soon as I say “stop.”

The number of letters recited is noted down.

Finally, the subject is given instructions to do both the physical and the mental task. The number of triangles drawn and the number recited are noted down for series 3.

Note: In between each trial, give the subject a rest of 3 minutes

Table 1: Individual data showing coefficient of divisibility of the subject

| Series | Trial 1 | Trial 2 | Trial 3: D1+D2 | Coefficient of Divisibility |
|-----------------------------------|----------------|----------------|---------------------------|--|
| Two Physical Tasks | | | | |
| Two Mental Tasks | | | | |
| One Physical & One Mental Task | | | | |
| Average | | | | |

Table 2: Coefficient of Divisibility for the group in every series

| S. No. | Initials | Coefficient Divisibility Series 1 | of in | Coefficient Divisibility Series 2 | of in | Coefficient Divisibility Series 3 | of in | Average |
|----------------|-----------------|--|------------------|--|------------------|--|------------------|----------------|
| 1. | | | | | | | | |
| 2. | | | | | | | | |
| 3. | | | | | | | | |
| Average | | | | | | | | |

Analysis of division of Attention: Division of attention of the subject can be analyzed by calculating the co-efficient of division of attention (C.D.)

$$C.D. = 1 - \frac{D_1 + D_2}{S_1 + S_2}$$

Where:

S_1 = Score on first Physical Task done individually

S_2 = Score on second physical task done individually

D_1 = Score on the first task done along with the second task

D_2 = Score on the second task when carried out along with the first task

The closer the score on C.D. comes to 1, the higher the division of attention, which implies that, the subject's attention decreases when two tasks are done simultaneously.

The closer the score on C.D. comes to 0, the subject's attention is not affected when two tasks are done simultaneously. The subject may be good at doing two different tasks when done simultaneously with each hand.

UNIT II: SENSATION & PERCEPTION

Sensation is the stimulation of a sensory receptor which produces neural impulses that the brain interprets as a sound, visual image, odor, taste, pain, etc. Sensation occurs when sensory organs absorb energy from a physical stimulus in the environment. Sensory receptors then convert this energy into neural impulses and send them to the brain.

Perception is when the brain organizes the information and translates/interprets it into something meaningful (selective attention) or something that can be made sense of or rationalized by us. Furthermore, perception is how one "receives" this feeling or thought, and gives meaning to it through memories and emotions. Perception is mainly how our brain interprets a sensation. Information is obtained through collector, receptor, transmission, and coding mechanisms. Sensation and perception complement each other to create meanings from what we experience, yet they are two completely different ways of how we interpret our world.

Sensation is the input about the physical world that is produced by our sensory receptors. **Perception** is the process by which the mind selects, organizes, and interprets sensations. Our eyes see, our ears hear, our hands touch--or do they? Without interpretation, there is no point to sensation.

Sensation and perception are elements that balance and complement one another. They work together for us to be able to identify and create meaning from stimuli-related information. Without sensation, perception will not be possible, except for people who believe in extrasensory perception or ESP. And without perception, our sensations would remain to be "unknown" to us since there is no mental processing of what we sense.

Sensation and perception are two completely different elements in terms of how they process information. In sensation, the physical stimulus, together with its physical properties, is registered by sensory organs. Then, the organs decode this information, and transform them into neural impulses or signals. These signals are transmitted to the sensory cortices of the brain. The line of difference between sensation and perception is now drawn; perception follows sensation. In the brain, the nerve impulses go through a series of organization, translation and interpretation. Once perception is finished, a person is able to "make sense" out of the sensations. For instance, seeing the light (sensation) is different from determining its color (perception). Another example is that feeling the coldness of the environment is different from perceiving that winter is coming. Also, hearing a sound is different from perceiving the music being played.

CHAPTER IV: STROOP EFFECT

Introduction: The stroop effect is an example of cognitive inhibition and the hypothesis of parallel processing, which involves interpreting a stimulus input at different levels, for verbal and non-verbal. In the stroop effect, words are written in different colour inks and subjects are required to name the colour of the ink in which the word is written. The reaction time taken to name the colour is shortened if the word 'green' for example is written in green ink and so on. However, there is interference, that is, a slowing down of reaction time and increase in the errors if the colours represented by the word and the ink disagree.

Once an activity becomes automatic, it will be repeated simply by directing attention to the appropriate input. Therefore, when we direct attention to printed words, we read them automatically. The inability to read when the verbal and non-verbal information disagree is revealed by the Stroop effect. This phenomenon has been named after J. Ridley Stroop.

Expt No.:

Experimenter:

Date:

Subject:

Aim: To find out the interference of irrelevant stimulus information over the subject's performance through Stroop instrument

Plan: To conduct the experiment in two series:

1. Without irrelevant stimuli
2. With irrelevant stimuli

To compare the time taken and the accuracy of responses in the second series with that of the first series.

Materials required:

- i. List consisting of names of colour written in different colour inks
- ii. Stop watch
- iii. Writing materials

Experimental control

- i. Clear instructions must be given to the subject to call out the colour of the ink in which the word is written
- ii. The subject should not be stopped if he / she makes an error
- iii. Subject's first response has to be noted down

General information: This experiment is conducted to determine if the subject has difficulty in eliminating irrelevant information from the task presented.

Procedure:

The subject is seated comfortably and the stroop chart is introduced. The instruction for series I is then given, where the subject is asked to call out the name of the colours written. Stop watch is started and the subject starts calling out the colours that are written. Any error made by the subject is noted down. The time taken to complete reading the list is also noted.

In series II, the same procedure is repeated using the second list, this time, the subject has to call out the colour in which the letters are written.

Instructions:

Series I: “I will give you a list of names of colours. As I say START, Call out the name of the colours written in the list.”

Series II: “Do as how you did previously, but this time, you should read the colours of the ink in which they are written and not the word.”

Analysis of the Data:

1. Find out the time taken to complete reading each list
2. Find out the errors made by the subject in each list.
3. Compare the first series with the second series.

Table showing the individual subject’s performance through Stroop effect

| Initial | Series I | | Series II | | Difference | |
|---------|----------------|-------|----------------|-------|----------------|-------|
| | Time (seconds) | Error | Time (seconds) | Error | Time (seconds) | Error |
| | | | | | | |

Discussions:

1. Discuss the errors made in each series
2. Discuss the time taken in each series
3. Discuss the mean performance and the individual difference if any

Practical Application

- i. Clinical practice and investigation
- ii. Neuropsychological assessment
- iii. Measuring the selective attention capacity and skills
- iv. Assessment of Sensory modalities

CHAPTER V: MULLER LYER ILLUSION (Method of Average Error)

Introduction:

Illusion is a false perception. Here the person will mistake a stimulus and perceive it wrongly. For example, in the dark, a rope is mistaken as a snake or vice versa. The voice of an unknown person is mistaken as a friend's voice. A person standing at a distance who is not known may be perceived as a known person. Most of our illusions are visual and auditory. But illusions pertaining to other senses are also possible.

Aim: To determine the extent of Muller-Lyer Illusion by the method of average error.

Plan: Ascending and descending series to be done alternately. In each trial, the subject manipulates the variable stimulus to make it equal to the standard length of 16 cms.

Materials:

- a) The Muller-Lyer illusion board
- b) Writing materials

Experimental controls:

1. The experimenter should make sure that the subject has understood the instructions.
2. The distance between the subject and the apparatus is kept constant.
3. The variable line should be held definitely longer in the descending series and shorter in the ascending series.
4. The starting point of variable line should vary from trial to trial to avoid habituation.

Procedure:

The subject is made to sit comfortably. The apparatus is placed at a distance of two feet from the subject and the Muller Lyer Illusion board is adjusted to the eye level of the subject. The subject is shown the standard and variable lines.

Ascending series: Keep the variable line definitely shorter than the standard line in the ascending series. Instruct the subject to slowly increase the length of the variable line, till he/she feels it is equal to the standard line. When the subject stops moving, the length of the variable line adjusted as equal to the standard line is noted down with the help of the scale provided behind the apparatus, by the experimenter. Ten trials are given.

Descending series: The length of the variable line is kept definitely longer than the standard line in the descending series. The subject is instructed to slowly decrease the length of the variable line till he/she feels it is equal to the standard line. The length of the variable line adjusted as equal to the standard line is noted down with the help of the scale behind the apparatus by the experimenter. Ten trials are given here also.

Note: the ascending and descending trials are given alternately to eliminate practice effect.

Instructions:

Ascending series: "The line between the two arrow heads is the standard line and its length remains constant. The line between the two feather-heads is the variable line and its length can

be varied by manipulation. In this series the variable line is held shorter than the standard line. Slowly increase the length of the variable line till you feel it is equal to the standard line”.

Descending series: “Now the variable line is held longer than the standard. Decrease the length of the variable line. Stop when you feel the line is equal”

Precautions: The distance between the subject and the apparatus should be two feet.

Table showing the individual extent of illusion in Muller Lyer experiment

| Sl. No. | Extent of error in ascending series | Extent of error in descending series |
|---------|-------------------------------------|--------------------------------------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| Mean | | |
| Error | | |

Analysis of Data:

1. In each trial, the subject’s judgment of the length of the variable line is noted by the experimenter. This is the point of subjective equality (PSE).
2. The mean PSE is calculated for each series.
3. The constant error (CE) is calculated in each series.

$$\text{CE (Asc.)} = \text{Mean PSE (Asc.)} - \text{Standard Line (16 cms)}$$

$$\text{CE (Des.)} = \text{Mean PSE (Des.)} - \text{Standard Line (16 cms)}$$
4. Calculate the mean CE

$$\text{Mean CE} = \frac{\text{CE (Asc.)} + \text{CE (Des.)}}{2}$$

5. The movement error is calculated by using the formula

$$\frac{|\text{Mean PSE}_{(\text{Des.})} - \text{Mean PSE}_{(\text{Asc.})}|}{2}$$

Discussion: Discuss whether method of presentation has affected the subject’s extent of illusion.

CHAPTER VI: DIFFERENTIAL LIMEN FOR WEIGHTS

Introduction: Minimal Stimulus differences refer to the minimal differences qualitatively and quantitatively, needed between two stimuli so that the subject can recognize them as different. The minimum value difference varies from one testing situation to another and from one subject to another. The method of minimal changes may be used for measuring the differential threshold. The differential threshold is defined as the time. For instance if we present a subject with two blocks differing only very little in weight, he/she will fail to report a difference between the two so as to obtain a judgment of different on half the trials, this difference defines the differential threshold.

Problem: To determine the differential for lifted weights limen by using the method of minimal changes for lifted weights.

Materials:

1. 11 variable weights (ranging from 40 gms to 60 gms, with an increase of 2 gms per weight).
2. 1 standard weight of 50 gms. (All weights are similar in height, color, size and shape).
3. Writing Materials

Plan: To conduct the experiment in 2 series (Ascending and Descending) using 1 standard weight and 11 variable weights. In each series, the subject is asked to compare each variable weight to the standard weight and judge it as lighter, equal, or heavier. 5 trials are given for Ascending Series and 5 for Descending Series alternatively.

Hypothesis: There is a Differential Limen for weights.

Variables:

Independent Variable: 1 Standard weight and 11 Variable weights.

Dependent Variable: The subjects judgment of heavier, equal or lighter of the variable block.

Procedure: The subject is made to stand at the table on which the weights are placed. The variable weights are arranged in semi circle with the minimum weight of 40 gms to the left of the subject and the maximum weight of 60 gms to the right of the subject. The standard weight of 50

gms is placed 6" away from the subject and the variable weights are placed 6" away from the standard weight. In the ascending series the subject must lift the standard weights with the help of a hook, replace it, and then lift the 1st variable weight (40gms.). The subject is asked to judge whether each of the variables is heavier, equal or lighter to the standard weight by lifting the weights by the hook with the thumb, the index finger and the middle finger with the preferred hand. The subject is asked to use the same force and lift the weights up to the same height (Elbow Level). The experimenter instructs the subject to compare the variable weight to the standard weight and note the responses. The subject is instructed to lift the standard weight again and compare it with the next variable weight.

In the descending series, the subject works from right to left. Five trials are presented alternatively in each series. The experimenter determines in each series. The experimenter determines the differential limen for weights.

Instructions:

I have placed 11 weights in a semi circle form in front of you. These are the variable weights. I have also placed a single weight 6" away from you. This is the standard weight. I want you to lift the standard weight with this hook using two fingers and the thumb of the preferred hand, to your elbow level. Replace this weight and then lift the 1st variable weight which is to your extreme left. Compare the weights and tell me if you feel the variable weight is heavier, equal, or lighter than the standard weight. Lift the standard weight, again move to the next variable weight. This is the Ascending Series.

In the descending Series compare the variable at the extreme right with the standard weight and move to your left. You must immediately report whether the variable is heavier lighter or equal.

Experimental Controls:

1. The subject should not lean or rest the non preferred hand on the table.
2. All weights must be lifted vertically to the specified height from the table.
3. The weight must be replaced gently without making any noise as this may give cues regarding the weights.

4. The subject should use the hook to lift the weights with the help of the thumb, the index and the middle finger.

Table 1 showing the judgment by the subject in Ascending and Descending Order

| Name | Weights in Gms | Ascending Series | | | | | Weights in Gms | Descending Series | | | | |
|------|-------------------|------------------|---|---|---|---|-------------------|-------------------|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | | 1 | 2 | 3 | 4 | 5 |
| | 40 | | | | | | 60 | | | | | |
| | 42 | | | | | | 58 | | | | | |
| | 44 | | | | | | 56 | | | | | |
| | 46 | | | | | | 54 | | | | | |
| | 48 | | | | | | 52 | | | | | |
| | 50 | | | | | | 50 | | | | | |
| | 52 | | | | | | 48 | | | | | |
| | 54 | | | | | | 46 | | | | | |
| | 56 | | | | | | 44 | | | | | |
| | 58 | | | | | | 42 | | | | | |
| | 60 | | | | | | 40 | | | | | |
| | | | | | | | | | | | | |

UNIT III: LEARNING

Learning may be defined as “*any relatively permanent change in behaviour or behavioural potential produced by experience*”. The process of learning has certain distinctive characteristics. *The first feature is that learning always involves some kinds of experience.* We experience an event occurring in a certain sequence on a number of occasions. If an event happens then it may be followed by certain other events. For example, one learns that if the bell rings in the hostel after sunset, then dinner is ready to be served. Repeated experience of satisfaction after doing something in a specified manner leads to the formation of habit. Sometimes a single experience can lead to learning. A child strikes a matchstick on the side of a matchbox, and gets her/his fingers burnt. Such an experience makes the child learn to be careful in handling the matchbox in future.

Behavioural changes that occur due to learning are relatively permanent. They must be distinguished from the behavioural changes that are neither permanent nor learned. For example, changes in behaviour often occur due to the effects of fatigue, habituation, and drugs.

Learning takes place in many ways. There are some methods that are used in acquisition of simple responses while other methods are used in the acquisition of complex responses. In this section you will learn about all these methods. The simplest kind of learning is called conditioning. Two types of conditioning have been identified. The first one is called classical conditioning, and the second instrumental/operant conditioning. In addition, we have observational learning, cognitive learning, verbal learning, concept learning, and skill learning.

Pavlov first investigated classical conditioning in the course of studies on digestion in dogs. In this kind of learning an organism comes to associate stimuli. A neutral stimulus (CS) that signals an unconditioned stimulus (US) begins to produce a response (CR) that anticipates and prepares the organism for US.

Skinner first investigated operant or instrumental conditioning (OC). An operant is any response voluntarily emitted by an organism. OC is a type of learning in which response is strengthened if followed by reinforcement. A reinforcer can be any event that increases the frequency of preceding response. Thus, the consequence of a response is crucial. The rate of OC is influenced by the type, number, schedule, and delay of reinforcement.

Observational learning is also known as imitation, modeling and social learning. We acquire knowledge by observing a model's behaviour. The performance depends on whether the model's behaviour is rewarded or punished.

In verbal learning words get associated with one another on the basis of structural, phonetic, and semantic similarity and contrast. They are often organised in clusters. In experimental studies, paired-associates learning, serial learning, and free recall methods are used. Meaningfulness of material, and subjective organisation influence learning. It may be incidental also.

Concept is a category. It involves a set of features connected with a rule or instruction. A concept can be natural or artificial. Artificial concepts are well-defined while natural concepts are usually ill-defined.

Skills are learned by practice and exercise. Any skilled performance is the organisation of the S-R chain into large response patterns. It passes through cognitive, associative, and autonomous phases.

Effect of prior learning on new learning is called transfer of learning. It may be general (e.g., warm-up) or specific. It depends on similarity of S-R associations in the two learning tasks.

CHAPTER VII: HABIT INTERFERENCE

Introduction:

Habit Interference or Negative Transfer refers to the inhibition of performance produced by prior learning – that is, when previous learning disrupts the performance of a subsequent task. In a new situation, performance would be poorer than it would have been without previous training. Habit interference can be studied by making use of a pack of cards and two sets of pigeon holes. The cards are sorted differently into the two sets. Maximum negative transfer effect can be expected because the two tasks present the same stimuli and call for the same response but with all the partners changed from one task to the other. The results of such experiment show marked negative transfer.

Aim: To study the interference of one habit over another

Materials required: Habit interference board, a pack of 40 cards (the cards consist of the four subsets of ten cards each) and a stop clock.

Controls:

1. The subject should not change his / her position during any part of the experiment
2. The cards must be shuffled thoroughly
3. Whenever the subject places a card in a wrong compartment, he / she has to rectify the mistake

Procedure:

Series 1: The card sorting tray is placed on a table. The subject sorts the cards standing in front of the tray. The cards are shuffled thoroughly and the subject is asked to hold the cards face up. The subject is instructed that the pack of cards have different designs. Section A of the tray is placed which has four compartments, each marked with a design. The subject has to take each card, and place it in the compartment with the corresponding design. When an error is made, the subject has to pick up the card immediately, and place it in the correct compartment. The subject has to work as fast as possible, and try to reduce the time taken to sort from trial to trial. But, he /she must not sacrifice, accuracy for speed. Instruct the subject to begin, and start the stop clock simultaneously. Give five such trials and note down the time taken in each trial.

Series 2: On the sixth trial, section B of the tray is placed before the subject. The subject is asked to sort the cards again. The time taken is notes.

Instructions: *With the signal 'start' you begin sorting the cards into their respective compartments of the tray. Whenever you place a card in the wrong compartment, place it back correctly. Work fast.*

Analysis:

1. The time score of the sixth trial is compared with that of the fifth trial for evidence of negative transfer of learning for the subject.
2. The average time score of the sixth trial is compared with the mean of the 5th trial for the group
3. The time score for all the six trials are plotted on a graph, both for the individual and the group.

Table 1 showing the time taken by the subject to sort the cards in each trial

| | Section A | | | | | Section B |
|-------------------|-----------|---|---|---|---|-----------|
| Initials / Trials | 1 | 2 | 3 | 4 | 5 | 6 |
| | | | | | | |

Table 2 showing the time taken by the group to sort the cards in each trial

| | Section A | | | | | Section B |
|-------------------|-----------|---|---|---|---|-----------|
| Initials / Trials | 1 | 2 | 3 | 4 | 5 | 6 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Total | | | | | | |
| Mean | | | | | | |
| Range | | | | | | |

Discussion:

- a) Discuss whether Negative transfer of learning has taken place, in the subject as well as the group.
- b) Discuss individual differences if any.

CHAPTER VIII: BILATERAL TRANSFER OF LEARNING

Introduction:

Transfer of learning is one of the most universally applied principles in practicing or learning a motor or sport skill. A man's activities (everyday's experiences) show that each activity is in succession to the other. When an organism undergoes new task and new problems, its behaviour may be seriously affected by the results of past learning and conditioning. Its only through such cumulative effects of learning that steady intellectual development and growth, progressive refinement of skills and creative thinking are made possible. Thus, whenever one activity affects another following it (either by facilitating it or interfering with it, there is set to be transfer). As Sandiford pointed out, all education is based on the existence of phenomena of transfer. The educators object it to teach a child or an adult principles or methods for dealing with specific task in different situations. There are different kinds of transfer:

- a) **POSITIVE TRANSFER:** Its effects occur if experience facilitates the acquisition of a new scale or solution of a new problem placed in the new situation. The learner performs significantly better than he would without the benefit of past training.
- b) **NEGATIVE TRANSFER:** Its effects are inferred if past experience renders more difficult or slows down the acquisition of a new skill or the solution of a new problem. Placed in the same situation, the learner performs more poorly than he would perform without training.
- c) **ZERO TRANSFER:** It denotes the fact that performance in the new situation is neither aided nor hindered by the past training. A statement that there's no zero transfer can mean only that with the measuring device of our disposal, no transfer effect from our situation to other situation can be detected.

Aim: To demonstrate the phenomenon of bilateral transfer.

Materials required:

- 1. A mirror tracing board / mirror drawing apparatus
- 2. Stop watch
- 3. Response sheet

Mirror Drawing Apparatus: The apparatus operates on A.C. Mains. It consists of a metallic plate with star pattern groove placed on the wooden board of the apparatus and a mirror in front and perpendicular to the board. It can be adjusted in front of the subject in such a way that the subject can view the star pattern through the mirror. An adjustable plate is also provided in front of the metallic plate in order to obstruct the direct view of the star to the subject, i.e., the plate is adjusted in such a way that the subject can see the star by only looking through the mirror. The metallic plate and a stylus is connected to electric current in such a way that whenever the stylus touches the metal plate the electric circuit pathway is closed and a light burns. The grooved area

of the metallic plate is hollow and it is placed over the wooden board so that if the stylus travels through the groove, it does not conduct electricity so long as it does not touch the metal plate.

The apparatus is connected with a Digital Error Counter and Digital Timer. As soon as the subject places the stylus at the starting point of grooved path of the star the Digital Timer immediately starts recording time in seconds and its decimal parts. And whenever there is an error the digital error counter automatically records one error in digital form.

Procedure: The experiment will be done in three conditions.

- i. In the first **pre-test condition** the subject will be given three trials in which he will trace the star pattern viewing its image in the mirror with his left hand in the clockwise direction.
- ii. In the second **test condition** the subject will learn to trace the star pattern with his right hand in the anti-clockwise direction. In this practice / learning condition he will be given as many trials till he reaches the pre-set criterion of three errorless consecutive trials.
- iii. In the third **post test** condition the subject again traces the star pattern three times with his left hand in the clockwise direction.

Instructions: *“I shall put the stylus (handing over) in your (left/right) hand and place it at the starting point on the star pattern. On hearing “START” you will start moving the stylus in the groove in pre-indicated direction (Clockwise/Anticlockwise) tracing the pattern, viewing it in the mirror, taking care that you do not touch either of the boundaries (inner or outer) of the star pattern and taking the least time. As soon as you reach the starting point again the trail will complete and you will stop on hearing “STOP”. Touching the boundaries will be an Error. Your performance will be of high quality if it is errorless and quick. Please pay attention to your feeling and thoughts too, you will be required to give introspection report.*

Result: The Average of Errors and the Time taken are computed separately for all the three experimental conditions. The difference between the average time and average errors in two experimental conditions upright between pretest and posttest condition give the result of Transfer of learning or Bilateral transfer experiment.

Interpretations: If the differences in the averages in both the experimental conditions (averages in posttest conditions minus the averages in pretest conditions) are positive, the transfer of learning is positive. This implies that there is a positive effect of learning of the subject with his/her right hand on the performance with his/her left hand, which means that after the learning of mirror drawing with right hand, there was certain improvement in the mirror drawing with his left hand. This improvement is exhibited in terms of decrement in the average errors and time in posttest experimental conditions as compared to the pretest experimental conditions.

Table 1 showing the experiment results

| Averages | Experimental Conditions | | Differences |
|-----------------------|--------------------------------|----------------------|--------------------|
| | Pretest (I) | Posttest (II) | |
| Errors | | | |
| Time (in sec.) | | | |

Difference in Average Errors = Average No. of Errors in pretest conditions - Average No. of Errors in posttest conditions

Difference in Average Time = Average No. of Time in pretest conditions - Average No. of Time in posttest conditions.

CHAPTER IX: PAIRED ASSOCIATE LEARNING

Introduction

Paired-associate (PA) learning was invented by Mary Whiton Calkins in 1894 and involves the pairing of two items (usually words)—a stimulus and a response. For example, words such as *calendar* (stimulus) and *shoe* (response) may be paired, and when the learner is prompted with the stimulus, he responds with the appropriate word (*shoe*).

The study of PA learning has been important for a number of reasons. Psychologists view it as representative of the kind of learning that people engage in every day. For example, when learning a new word, a person must pair the word itself with the concept it represents. This is the essence of PA learning. Another reason is that it allows researchers to study the associations between stimuli and responses. Although this stimulus-response approach has lost some of its importance in contemporary psychology, researchers—especially behaviorists—have been interested in how stimulus-response links are formed and broken.

Psychological research has revealed that when people learn paired associates, they engage in two separate mental processes. The first is the learning of the response; the second is the formation of a bond between the two words. This second process seems to produce a one-way association in many circumstances. That is, a learner is much more likely to remember the response word if given the stimulus; people have a harder time remembering the stimulus if presented with the response word.

This pattern holds true when the response has never been used as a stimulus. On the other hand, if a particular word (e.g., *cloud*) has been used both as a stimulus and as a response (e.g., *cloud-pen* and *bag-cloud*), the learner gets accustomed to using the word in two ways. In later testing, the subject is likely to remember the word pair correctly when presented with either word. Based on research such as this, psychologists have concluded that learners remember the word pair as a unit, not as a stimulus that simply leads to a response.

Problem: To study the effect of meaningfulness of stimulus – response relationship on the formation of associations.

Plan:

1. To conduct the experiment in two series:
 - a. With no specific meaningful relationship between stimulus and responses
 - b. With logical or meaningful connections between stimulus and responses.
2. To test recall of response words separately in both the series and compare.
3. To study the effect of meaningfulness of responses in the formation of associations with the stimuli.

Controls:

1. Time of exposure is limited to two seconds per pair for both the lists.
2. The difficulty level of words used is held constant in both the series.
3. The time to respond to each stimulus is limited to three seconds.

Materials:

1. Two list of paired-associates, each pair written on a card. The stimulus word from each pair is also written on the back of the corresponding card.
 - a. List A – Ten pairs of words with no specific meaningful relationship
 - b. List B - Ten pairs of words with logical or meaningful connections between stimuli and responses.
2. Stop clock

Procedure:

Series 1: Instruct the subject to observe carefully, the exposed stimulus-response pairs. Clarify to him / her that in each pair the first words is the stimulus and the second word is the response (an example may be given using a pir other than the ones in the two lists). Inform the subject that recall will be tested for the response words paired with each stimulus. With these instructions, present the first pair, from list A for two seconds then the second and so on till all the one by one at random and obtain responses. Note down the responses given by the subject. Allow three seconds for the subject to respond to each stimulus word.

Give a five minute rest period to avoid interference before starting the second series.

Series 2: Follow the same procedure as in the first series using list B.

Instructions:

1. *With the signal “ready” I will expose a series of cards with pairs of words, in which the first word is the stimulus and second word is a response, observe carefully as you have to recall the response words later.*
2. *Now I will present only the stimulus words, you write down the corresponding words.*

Analysis:

1. Count the number of response words correctly recalled in each list.
2. Find out the difference in the number of words correctly recalled in each series:
[Difference = Score in series 2 – Score in series 1]
3. Calculate the group Mean and Standard Deviation

Points for Discussion:

- a) Discuss whether meaningfulness of the stimulus response relationship has increased recall for the subject as well as the group
- b) Discuss the individual differences, if any

Table 1 showing the number of words correctly recalled in each list by the subject

| | No. of Response words correctly recalled | | |
|---------|--|------------------|--------------------|
| Initial | Series 1: List A | Series 2: List B | Difference (B – A) |
| | | | |

Table 2 showing the number of responses correctly recalled in each list by the group

| | No. of Response words correctly recalled | | |
|---------|--|------------------|--------------------|
| Initial | Series 1: List A | Series 2: List B | Difference (B – A) |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Total | | | |
| Mean | | | |
| SD | | | |

UNIT IV: MEMORY

Human memory, like memory in a computer, allows us to store information for later use. In order to do this, however, both the computer and we need to master three processes involved in memory. The first is called encoding; the process we use to transform information so that it can be stored. For a computer this means transferring data into 1's and 0's. For us, it means transforming the data into a meaningful form such as an association with an existing memory, an image, or a sound.

Next is the actual storage, which simply means holding onto the information. For this to take place, the computer must physically write the 1's and 0's onto the hard drive. It is very similar for us because it means that a physiological change must occur for the memory to be stored. The final process is called retrieval, which is bringing the memory out of storage and reversing the process of encoding. In other words, return the information to a form similar to what we stored.

The major difference between humans and computers in terms of memory has to do with how the information is stored. For the most part, computers have only two types; permanent storage and permanent deletion. Humans, on the other hand are more complex in that we have three distinct memory storage capabilities (not including permanent deletion). The first is Sensory memory, referring to the information we receive through the senses. This memory is very brief lasting only as much as a few seconds.

Short Term Memory (STM) takes over when the information in our sensory memory is transferred to our consciousness or our awareness (Engle, Cantor, & Carullo, 1993; Laming, 1992). This is the information that is currently active such as reading this page, talking to a friend, or writing a paper. Short term memory can definitely last longer than sensory memory (up to 30 seconds or so), but it still has a very limited capacity. According to research, we can remember approximately 5 to 9 (7 ± 2) bits of information in our short term memory at any given time (Miller, 1956)

If STM lasts only up to 30 seconds, how do we ever get any work done? Wouldn't we start to lose focus or concentrate about twice every minute? This argument prompted researchers

to look at a second phase of STM that is now referred to as Working Memory. Working Memory is the process that takes place when we continually focus on material for longer than STM alone will allow (Baddeley, 1992).

What happens when our short term memory is full and another bit of information enters? Displacement means that the new information will push out part of the old information. Suddenly some one says the area code for that phone number and almost instantly you forget the last two digits of the number. We can further sharpen our short term memory skills, however, by mastering chunking and using rehearsal (which allows us to visualize, hear, say, or even see the information repeatedly and through different senses).

Finally, there is long term memory (LTM), which is most similar to the permanent storage of a computer. Unlike the other two types, LTM is relatively permanent and practically unlimited in terms of its storage capacity. It's been argued that we have enough space in our LTM to memorize every phone number in the U.S. and still function normally in terms of remembering what we do now. Obviously we don't use even a fraction of this storage space.

There are several subcategories of LTM. First, memories for facts, life events, and information about our environment are stored in declarative memory. This includes semantic memory, factual knowledge like the meaning of words, concepts, and our ability to do math (Lesch & Pollatsek, 1993, Rohrer et al., 1995) and episodic memory, memories for events and situations (Goldringer, 1996; Kliegel & Lindberger, 1993). The second subcategory is often not thought of as memory because it refers to internal, rather than external information. When you brush your teeth, write your name, or scratch your eye, you do this with ease because you previously stored these movements and can recall them with ease. This is referred to as nondeclarative (or implicit) memory. These are memories we have stored due to extensive practice, conditioning, or habits.

CHAPTER X: RETROACTIVE INHIBITION

Introduction:

It is believed that forgetting may occur as a result of different types of interferences with memory. When past memories interfere with memories of recent experience, it is known as Pro-active Inhibition. When memories of recent experience interfere with the past memories it is known as Retroactive Inhibition.

Retro-active Inhibition refers to the difference in the degree of forgetting resulting from the interpolation of a formal learning task, as compared with an equivalent period free from learning activity. Retro-active Inhibition is a case of negative transfer of learning, as the learning of one task interferes with the retention of another. Experiments have shown Retro-active Inhibition to be a highly reliable and predictable phenomenon. At the same time it is true that the degree of Retro-active Inhibition varies with a wide range of experimental variables like different conditions of interpolation, the extent of similarity between the old and the new materials, strength of learning the original material and the interpolated activity.

Problem: To demonstrate the phenomenon of Retro-active Inhibition on recall of verbal material.

Hypothesis: Retro-active Inhibition has a negative effect on recall of verbal material.

Plan: The experiment is conducted in two series- *without interpolation and with interpolation*. The number of words correctly recalled under the two series is compared and the extent of Retro-active Inhibition is determined.

Variables:

Independent Variable: The presentation of list 'C' as interpolated activity.

Dependent Variable: Number of words recalled.

Materials:

1. Three lists of meaningful words with 20 words in each list. Lists B & C are synonyms.
2. Stop Clock
3. Letter Cancellation Sheet

Procedure:

Series 1 – (*without Interpolated Activity*): Instruct the Subject to listen carefully to the list of words presented orally and to learn it since he/she has to recall it later. Give a 'Ready' Signal and present the list orally at the rate of two seconds per word. Present the list five times with an

interval of five seconds between each word in the list. After the fifth presentation, give a distraction period of 280 seconds during which the Subject is given letter cancellation so that he/she may not rehearse the list. Now ask the Subject to recall list A and note down the number of words correctly recalled.

Series 2 – (*with Interpolated Activity*): Following the same procedure as above, present list B five times. During the distraction period of 280 seconds, present list C five times for Interpolation. This covers 220 seconds (200 seconds, presentation, and 20 seconds interval between presentations.). For the remaining 60 seconds engage the Subject in letter cancellation. Ask the subject to recall list B and note the number of words correctly recalled.

A memory drum can also be used for presentation of the words.

Instructions:

I will call out a list of words, listen to them carefully, and you have to reproduce the same when you are asked to do so.

Controls / Precautions:

1. The difficulty level of the words must be equal in all the list.
2. The words of lists B and C must be similar in meaning.
3. In the second series, the subject should not be aware that he/she has to recall list B.
4. During the distraction period, the Subject must be kept occupied with letter cancellation or mathematical sums or any such unrelated activities.

Analysis:

1. Determine the number of words recalled correctly in lists A and B separately and find the difference.
2. Calculate Mean and Standard Deviation for the Group.

Points for Discussion:

- a) Discuss whether Retro-active Inhibition has influenced the recall of list B.
- b) Discuss variations in the group if any.

CHAPTER XI: EFFECT OF CUEING ON RECALL

Experimenter:

Subject:

Aim: To study the effect of cueing on recall of verbal material.

Materials required:

1. Two lists of thirty word each
 - a) The words in list A are selected randomly.
 - b) The words in list B are selected such a way that they fall into five categories with six words in each category.
2. Plain response sheet with names of the five category printed on them for recall of list
3. Stop clock.

Procedure:

Series 1: Free recall: The subject is instructed to listen carefully the list of words, which be presented verbally by the experiment and recall or write them as soon as possible. List A will be presented in an even tone of two second per second then the subject will be given plain response sheet and asked to recall or write the list. After a five minute passes will be given before the second serious.

Series 2: Free recall: Now list B is presented in the same manner as list A. Again the subject is given another plain response sheet with the names of the five categories. The subject is now asked to write down as many words from list as subject can recall. A time span of 3 minutes shall be allowed to recall or write.

Instruction:

Listen to the words attentively as I read them out, as you have to recall or write them as soon as possible.

Results:

Table I shows the individual data of subject.

Table II shows the group data of class.

Analysis:

1. Find the number of words correctly recalled from each list separately.
2. Calculate the difference: Difference = Score in serious 2 – Score in series1.
3. Calculate mean and standard deviation (SD) for the group.

General discussion:

A cue is a signal which elicits a behavior based on our previous experience. Cues are helpful to group information together, organize and store them in memory. The cue-recalled procedure is a form of memory testing that uses particular cues as the words to recall. The items in the list are presented so that the number of items recalled is greater than the number of items presented. The item will be recalled better if the subject recalls the word along with its meaning.

LIST A

- | | | |
|----------------|---------------|--------------|
| 1. BUILDING | 11. PURSE | 21. RELIGION |
| 2. CLOWN | 12. BUTTERFLY | 22. MONKEY |
| 3. GINGER | 13. NOISE | 23. QUEEN |
| 4. HOUSE | 14. UMBRELLA | 24. SALAD |
| 5. ELECTRICITY | 15. WATER | 25. HEAD |
| 6. ATHLETE | 16. FESTIVAL | 26. SNOW |
| 7. DANCE | 17. SUGAR | 27. WINDOW |
| 8. LIFT | 18. MOUNTAIN | 28. ZEBRA |
| 9. MEDICINE | 19. SOLDIER | 29. TOWEL |
| 10. KITE | 20. ECONOMY | 30. STOOL |

LIST B

- | | | |
|------------|---------------|----------------|
| 1. BLUE | 12. PLATINUM | 23. LILLY |
| 2. GOLD | 13. SUNFLOWER | 24. RECTANGLE |
| 3. JASMINE | 14. TRIANGLE | 25. WATERMELON |
| 4. SQUARE | 15. LEMON | 26. PINK |
| 5. APPLE | 16. GREEN | 27. COPPER |
| 6. BLACK | 17. IRON | 28. HIBISCUS |
| 7. SILVER | 18. ROSE | 29. CYLINDER |
| 8. LOTUS | 19. CONE | 30. MANGO |
| 9. CIRCLE | 20. BANANA | |
| 10. GRAPE | 21. YELLOW | |
| 11. RED | 22. ALUMINIUM | |

RESPONSE SHEET FOR LIST B

| S. No. | SHAPE | FRUITS | COLOURS | METALS | FLOWERS |
|---------------|--------------|---------------|----------------|---------------|----------------|
| 1. | | | | | |
| 2. | | | | | |
| 3. | | | | | |
| 4. | | | | | |
| 5. | | | | | |
| 6. | | | | | |
| 7. | | | | | |
| 8. | | | | | |
| 9. | | | | | |
| 10. | | | | | |

CHAPTER XII: EFFECT OF CHUNKING ON RECALL

Experimenter:

Subject:

Aim:-

To study the effect of chunking on recall

Materials Required:

1. Words Cards
 - a) Set –A (Without-Chunking)
 - b) Set-B (With- Chunking)
2. Stop Clock

Procedure:

Set-A without Chunking: The subject is seated comfortable and the subject is instructed to see the letters exposed in the card at the ready signal and recall immediately as many letters from the card as possible. expose the first card from set A within a two seconds. Allow the subject to recall and write down as many as letters as possible. Allow a maximum of 15 seconds.

Set-B without Chunking: Follow the same procedure as mentioned set A

Instructions to the subject:

The experimenter exposes a set A cards containing (10 cards) letters in the same order after each card. After that set B cards exposes by experimenter the same order after each card. The subject to recall or write down as many as letters as possible. In case you forget any letter in between draw a line in that position and proceed.

Results:

Table-I Shows the individual data of Non-chunked and Chunked scored.

Table-II Shows the Group data of Non-chunked and Chunked scored.

Analysis:

1. Count the average number of letters correctly.
2. Find out the average number of letters correctly recalled by the subject with and without chunking.
3. Calculate the differentiate using.
4. Calculate Standard Deviation (SD) of the Group data.

General Discussion:

Chunking is a process of items contains several separate bits of information. Working memory can hold only about seven (plus or minus two) discrete items. Beyond that point the system becomes overloaded, and if new information enters, existing information is lost (e.g., Miller, 1956) each of these “items” can contain several separate bits of information –bits that are somehow related and can be grouped together into meaning units. For example, consider the following list of letters: IBFIMBWBMATWIAC. After hearing or reading it once. How many could you remember? Probably no more than about seven. But imagine the instead. The letters were presented as follows: FBI. IBM, BMW, TWA, CIA. Could you remember more now? Because now the letters are grouped in meaning chunks, working memory can hold a larger only seven to nine separate items at once.

UNIT V: THINKING

Thinking is a complex mental process which involves manipulation of information. Such information is collected through our senses (such as vision, hearing, smelling etc) from the environment, as well as the information which is stored in our memory because of our encounter with many events and situations in the past. Thinking is a constructive process in the sense that it helps us to form a new representation of any object or event by transforming available information. It involves a number of mental activities, such as inferring, abstracting, reasoning, imagining, judging, problem solving, and creative thinking. Such activities take place in our mind and can be inferred from our behaviours. Thinking is usually initiated by a problem and goes through a sequence of steps such as judging, abstracting, inferring, reasoning, imagining, and remembering. These steps are often directed towards solution of the problem. Thinking relies on a variety of mental structures such as concepts and reasoning.

Concepts:

Concepts are one of the key elements of thinking. Concepts represent objects, activities, ideas, or living organisms. They also represent properties (such as “sour” or “brave”), abstractions (such as “anger” or “fear”), and relations (such as “smaller than” or “more intelligent than”). Concepts are mental structures which allow us to organize knowledge in systematic ways. We cannot observe them directly, but we can infer them from behaviour.

We as human beings have the capacity to abstract the essential characteristics of objects, events or whatever we perceive. For example, when we see a Potato we categorize it as ‘vegetable’, and when we see a towel we categorize it as ‘cloth’. Whenever we encounter a new stimulus we tend to treat it as a member of a familiar or remembered category and take the same action toward it and give it the same label.

Reasoning:

Reasoning is also one of the key aspects of thinking. It is a process that involves inference. Reasoning is used in logical thinking and problem solving. It is goal directed, and the conclusions or judgments are drawn from a set of facts. In reasoning, information from the environment and the stored information in the mind are used following certain rules. There are two types of reasoning: deductive and inductive. In deductive reasoning we try to deduce or draw

conclusion from a set of initial assertions or premises; where as in inductive reasoning we start from available evidence to generate a conclusion about the likelihood of something. Most cases of scientific reasoning are inductive in nature.

CHAPTER XIII: CONCEPT FORMATION

Introduction: Man forms concept of many persons and objects around him. The pattern of forming concepts in each individual is not uniform and it differs from person to person. Each one forms concept in his/her own way, based on some logic.

Aim: To find out how concepts are formed in the subject

Materials required: Seven sets of cards (7 cards each), with symbols on them and words on their back.

Description of the instrument: seven sets of cards of 7 cards each can be taken. On one side, there are symbols and on the other side some names are written. All the seven cards should signify one concept, in various designs. These seven cards should carry any non sense label, on their back. (eg. MUR, NAL, etc.)

Procedure: this experiment can be conducted for individuals, as well as for groups. The subject is seated comfortably and is shown all the 49 cards, on both sides. Each side of the cards can be shown for 5 seconds. After showing all the 49 cards, the subject is shown only the symbols and he / she should tell the name/label of the card. If the answer is wrong, it will be corrected immediately.

Precaution: all the 49 cards are shuffled in such a way that no two cards of the same group is shown successively. 5 seconds is given for the subject to study the card and form a concept. No disturbance is allowed during the experiment. The subject is not given unnecessary rest, as it would help him to remember the symbols.

Table 1 showing the concepts formed by the subject

| Subject's Initial | No. of concepts formed |
|-------------------|------------------------|
| | |

Table 2 showing the group data

| S. No. | Subject's Initial | Gender | No. of Concepts formed |
|-----------------------|--------------------------|---------------|-------------------------------|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| Mean of group | | | |
| Mean of male | | | |
| Mean of female | | | |

Discussion: Each subject may take the help of some association method in the process of remembering the symbols. It need not be the same for all persons. The subject may also tell the mental state experienced and the way of association adopted by him / her. Right or wrong responses regarding the symbols are spoken out. It will indicate the pattern of concept formation. Greater number of right responses indicates the subject is quite intelligent and he / she is able to form concepts easily with reasonable time.

Conclusion: Each one's pattern of concept formation differs and indicates one's impression, experience, knowledge, etc.

CHAPTER XIV: PROBLEM SOLVING

Problem solving is part and parcel of our daily life. Every day we solve a number of problems ranging from simple to complex. Some problems take little time where as some take much time to solve. We look for alternative solutions if do not get the right kind of resources to solve the problem in hand. In the case of solving any type of problem our thinking becomes directed and focused and we try to use all the resources, both internal (mind) and external (support and help of others) to arrive at the right and appropriate decision. For example if you want to score good marks in an exam, you study hard, take the help of teachers, friends, and parents and finally you score good marks. Thus problem solving is directed thinking focused towards dealing with a specific problem. This thinking has three elements: the problem, the goal, and the steps to reach the goal. There are two methods which are used prominently in problem solving. These are- “Means-end-analysis” and “Algorithms”. In the case of Means-end-analysis a specific step-by-step procedure is followed for solving certain types of problems. In the case of ‘heuristics’ the individual is free to go for any kind of possible rules or ideas to reach the solution. It is also called rule of thumb.

Problem Solving and Mental Set:

Sometimes we use a particular strategy/technique to solve a problem but we may or may not succeed in our effort to solve the problem. This creates a set to approach future problems that are encountered by a person. The set continues even if the problem is different. Despite this, we use the same strategy/technique when ever we come across the same problem and again fail to reach the solution. Such phenomenon in problem solving is called mental set. A mental set is a tendency on the part of an individual to respond to a new problem in the same manner that he or she has used earlier to solve a problem. Previous success with a particular rule produces a kind of mental rigidity/fixedness/set, which hinders the process of generating new ideas to solve a new problem. A mental set inhibits or affects the quality of our mental activities. However, in solving our real life problems we often rely on past learning and experience with similar or related problems.

Expt No.:

Experimenter:

Date:

Subject:

Aim: To study the process involved in problem solving

Materials required:

- iv. T cut puzzle (cut out parts of T puzzle)
- v. Rational learning materials (letters and numbers)
- vi. Stop watch

Procedure:

Series I:

The following instructions are given: *From the pieces given you have to construct the letter 'T.'* The time and behaviour is noted. The subject is asked to give the introspective report. Five trials altogether are given and the introspective report collected after fifth trial.

Table 1 showing the individual subject's performance for T puzzle

| Number of trials | Time Taken | Learning process |
|------------------|------------|------------------|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |

Series II:

The first ten letters of alphabets are taken and to each is assigned a number from 1 to 10 in a random order. The numbers are not revealed. The subject has to guess and find. The letters are called one at a time in alphabetical order so the subject has to guess the correct number from 1 to 10 associated with each alphabet. Each number given by the subject for the respective alphabet is recorded until she hits upon the correct number. The following instructions are given: *When I call out the alphabet you have to guess and tell me the number I have fixed to it. You can go on guessing until I say right.* Logical errors (L) are noted against an error's response if it is a number already established as a correct response. Perspective error (p) is noted if the same wrong member in the given series is repeated and all the other responses are unclassified errors.

The introspective report is taken in the end. The number of errors in each trial and total time for each trial is recorded.

Table 2 showing the individual data for code puzzle

| Number of trials | Logical errors | Perspective errors | Unclassified errors | Total number of errors | Time taken |
|------------------|----------------|--------------------|---------------------|------------------------|------------|
| 1. | | | | | |
| 2. | | | | | |
| 3. | | | | | |
| 4. | | | | | |
| 5. | | | | | |

For Discussion

1. Find out the average time taken for the five trials for the T puzzle.
2. Determine the average time taken for the code puzzle, the average number of logical, perspective and unclassified errors.
3. Study how the subject arrived at the solution for the T puzzle.
4. Find out the evidence for trial and error approach.

Analyse the introspective report and discuss how the mechanical puzzle was solved using the notes taken down about subject's behaviour.

How was the T puzzle solved? Is there any evidence for insight? Analyse with the help of introspective report and behavioural observation.

Which of the two puzzles was easiest / the most difficult to solve for the group.

Study how the group as a whole solved the two problems.

CHAPTER XV: CREATIVITY

Problem: To determine the level of creativity (verbal and non verbal) using a creativity test, based on the Wallach-Kogan creativity test

Materials:

- a) Wallach-Kogan Creativity test
- b) Writing materials
- c) Stop clock

Controls: Ensure that the subject works independently.

Plan: Administer the test to the subject, and determine the number of responses and uniqueness of responses (uniqueness of response analysis is to be restricted to the classroom).

Procedure: The subject is seated comfortably and is given the Creativity test. The subject should be informed that the booklet contains tasks under the headings of Instances, Alternate uses, Similarities, Pattern meanings and line meanings. The subject is asked to respond to the items, with a limit of three minutes for each subtest. The experimenter collects the booklet after administering the test and analyses the responses in terms of number and uniqueness.

Instructions: “Here are a number of tasks under headings of instances, alternate uses, similarities, pattern meaning and line meanings.”

Instances: “When I say ‘start’ write your responses to these items. There are all kinds of different answers that are possible, write as many as you can. You will be allotted three minutes for this subtest. There are four items under this heading.”

Alternate uses: “Write all the things that the object given in the questionnaire under the heading ‘Alternate uses’ could be used. Write as many uses you can think of. You will be allotted 3 minutes for this subtest. This subtest consists of six items.”

Similarities: “Write down all the possible ways the 2 objects named under the headings ‘Similarity’ are alike. You will be allotted 3 minutes for this subtest. This subtest consists of six items.”

Pattern meaning: “Write down all the things the design looks like. Feel free and make use of your imagination. There are six designs in this subtest. You will be allotted 30 seconds for each design. When I say ‘start’ you start responding to the first design and when I say ‘shift’ start responding to the next design.”

Line meaning: “Write down all the things the drawing as a whole makes you think of. You will be allotted 30 seconds for each drawing in the subtest. This subtest consists of six designs. When I say ‘start’ you start responding to the first drawing and when I say ‘shift’ start responding to the next drawing.”

Analysis of the results:

1. One mark is given for each meaningful response given by the subject for each stimulus item in each subtest. The subject's total score for number of a particular subtest consists of the sum of his responses on all items comprising that subtest.
2. For obtaining 'uniqueness' score: Uniqueness is defined as that response to a given item that is offered by only one or few subjects of the group. An individual's total score for uniqueness for a particular subtest consists of the sum of his unique responses to all the items comprising that subtest.
3. The average score for the 3 verbal tests is determined by adding the total score of the 3 verbal tests and dividing it by 16.
4. The average score for non verbal test is determined by adding the total score of the 2 non verbal tests and dividing it by 12.

Table 1 showing the number of responses of the subject under each subtest of Creativity

| Initials | Verbal Tests | | | Average for verbal tests | Non Verbal Tests | | Average for non verbal tests |
|----------|--------------|---------------------|--------------|--------------------------------|---------------------|------------------|---------------------------------------|
| | Instances | Alternative uses | Similarities | | Pattern Meanings | Line Meanings | |
| | | | | | | | |

Table 2 showing the number of responses and uniqueness of responses of the subjects of the group for verbal and non verbal tests of Creativity

| S. No. | Initials | Average No of Responses | | Total No of Unique responses for both Verbal and Non Verbal tests |
|--------|----------|-------------------------|------------------|---|
| | | Verbal Tests | Non Verbal Tests | |
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |
| Total | | | | |
| Mean | | | | |
| Range | | | | |