M.A. (PART - I)

SEMESTER - I (CBCS)

PSYCHOLOGY PAPER - PRACTICAL
(CORE COMPONENT)

EXPERIMENTAL PSYCHOLOGY PRACTICALS

SUBJECT CODE: PAPSY105

Dr. Suhas Pednekar
Vice Chancellor
University of Mumbai, Mumbai

Prof. Ravindra D. Kulkarni
Pro Vice-Chancellor,
University of Mumbai

Prof. Prakash Mahanwar
Director,
IDOL, University of Mumbai

Programme Co-ordinator	:	**Anil R. Bankar** Head, Faculty Head, Arts and Humanities, IDOL, University of Mumbai
Course Co-ordinator & Editor	:	**Dr. Naresh Tambe** Assistant Professor (Psychology), IDOL, University of Mumbai
Editor	:	**Ms. Pradnya Mohite** Psychology Coordinator, IDOL, University of Mumbai
Course Writers	:	**Mr. Meet D. Shinde** Smt P N Doshi Women's College, Cama Lane, Ghatkopar (W) Mumbai: 400086
	:	**Mrs. Dinika Sahil More** Kishinchand Chellaram College, K. M. Kundnai Chowk, Mumbai

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M.A. (PART - I)

PSYCHOLOGY PAPER-V, SEMESTER - I (CBCS)

EXPERIMENTAL PSYCHOLOGY PRACTICALS

CORE COMPONENT: 8 CREDITS, 15 WEEKS

SYLLABUS

Objectives -

1. To enable learners to design experiments in various areas of psychology
2. To help learners to design appropriate computer programs for the experiments
3. To enable learners to analyze and report the data of experiments

Unit 1: Experiment on Learning

Unit 2: Experiment on Motivation

Unit 3: Experiment on Memory

Unit 4: Experiment on Emotions

Unit 5: Experiment on Decision Making

Unit 6: Experiment on Problem Solving

Evaluation:

Internal evaluation: 25 Marks

Laboratory Work: 10 Marks

Journal Submission: 15 Marks

Semester end examination: 75 Marks

Paper pattern: 7 questions to be set of 15 marks each, out of which 5 are to be attempted.

1

EXPERIMENT ON LEARNING

Unit Structure :

1.0 OBJECTIVES

At the end of this unit, learner should be able to –

- Understand the concepts of Learning
- Understand different types of Learning and method of practice.
- Understand the concept of Paired associate learning
- Identify the I.V, D.V, and CVs in an experiment
- Understand the various concepts of this experiment.
- Explain the results in relation to the hypothesis of this experiment.

1.1 TITLE

Effect of Emotionally Valent Content on Paired Associate Learning.

1.2 INTRODUCTION

Learning is a relatively permanent change in behaviour because of practice and experience. Learning and retention are key concepts studied in Experimental Psychology. Experimenters have classified learning into different categories.

1.2.1 Types of Learning

- **Motor Skills:** In some activities fine and gross motor skills play an important role than words. This type of learning is called motor learning in which during the initial stage, words or verbal sequence are important but once the task is mastered verbal component in learning becomes negligible. The measurement of motor learning is done by assessing the nature and speed of the movements as well as results achieved by them, for example, a cricket coach may evaluate the performance of the student in terms of stance, strokes played and so on. The tasks like swimming, typing, driving involve motor skills.

- **Problem Solving**: In problem solving, the participant must discover and arrive at a correct response eliminating the erroneous ones. Problem solving involves trial and error, verbal processes play an important role in human problem solving.

- **Verbal Learning:** Verbal Learning is the process of learning about verbal stimuli and responses, such as letters, digits, nonsense syllables, or words. It is typically associated with the memorization and retention of lists of words, to describe basic elements of associative learning. Early work on verbal learning was done by Hermann Ebbinghaus. He served as his own subject, and his procedure involved the serial learning of nonsense syllables. Ebbinghaus would memorize lists of these syllables until he could recall them perfectly, setting different accuracy criteria for different experiments.

Experimental research on learning has emphasized the role of various variables that affect learning, like, attributes of learning material, method of practice of the material, characteristics of the learner.

The learning process can be influenced by several learner and environmental factors. The knowledge of these influences can help in improving learning situations. The participant’s motivation, readiness to learn, interest, ability, attention, mood, time of the day, environmental factors like noise, distraction, attributes of learning material, method of practice of the material

1.2.2 Attributes of Verbal Learning:

- **Meaningfulness of material:** Meaning facilitates learning as it helps to connect individual items with each other, the previous experiences also aid in learning the new material. Meaningfulness of material helps in organising and grouping items which helps learning. In order to study 'pure learning' and eliminate the influence of meaning on learning and have uniformly difficult material nonsense syllable were used in verbal learning experiments. But across experiments it is observed that meaningful material is learnt faster than non-meaningful material.

- **Dimension of Affectivity:** The emotional tone or the affectivity of the material to be learnt also determines the rate at which the material is learnt. It is seen in some cases that the rate of learning of the pleasant stimuli is faster than unpleasant stimuli. Not only may the affectivity of the material, but also verbal material evoke various attitude among the learner which may affect the rate of learning.

- **Amount of material learnt:** A long task would take more time to learn than a short one. It is experimentally seen that time taken to learn per item for a long task is more than the short task. An experienced learner would perform better than an inexperienced one when the list to learn is long, as the experienced learner is more skilful in organising and grouping the material than an inexperienced one.

1.2.3 Method of Practice:

Most of the learning is serial in nature. In serial learning, learning depends on the association among the members of the series. These associations between the items in the series are formed due to method of practice. Several methods of practice or presentation of stimuli have been developed in experiments on serial learning.

a) **Method of Complete Presentation:** In this method the participant is presented total series of items and is allowed to read it and explore the presented material at her/his own speed. A time limit is usually set to learn the items, but the experimenter has no control over how much time the participant spends to learn each item. Though the data of learning of individual item is difficult, the method is like the practical natural learning situation.

b) **The method of anticipation:** In this method the participants are presented a series of items at a time for a fixed time interval. Once all the items are presented, then the participants have to 'anticipate' each item before it appears. If the participant is unable to anticipate the item correctly then is shown the item again. Each trial is both a learning trial and a retention trial. The advantage of using this method is that the experimenter can analyse the various stages of learning like, the time taken to learn individual items, which items are learnt faster, how long is the item retained.

c) **The method of Paired associates:** In this method, participants are presented with pair of items and in subsequent trials only one of the items (stimulus word) is presented and the participant has to recall the word that was paired with it (response word). The learning happens due to the association between the stimulus and the response word. At a later time point, memory for those pairs is typically tested by having them either recall one of the words in response to the word it was paired with during encoding (e.g., recall the word that was paired with "stove"), or by asking them to distinguish between word pairs that were encoded together (e.g., stove – letter) and word pairs composed of two words that were studied, but were not paired during encoding (e.g., stove – dance; known as associative recognition).

It is generally assumed that learning of paired-associate items depends upon two major factors: the subject's behaviour in test phases, that is, active attempts at recall of correct responses together with observation of rewarding or punishing consequences, and the presentation of information by the experimenter. In the standard anticipation procedure, which has been used in most paired-associate experiments, these two aspects are confounded. Each trial begins with a presentation of the stimulus member of a pair alone, to which the subject attempts to recall the correct response; then the stimulus and response members are presented together, and the subject has an opportunity to experience reward or punishment.

Pair associative learning binds different terms or concepts together for the purpose of improved memory. Pengyun, Juan, Huijie, and Shouzi (2013) explain that "associative memory requires remembering of the relationship between items, such as pairs of words" (p. 2). Moreover, remembering newly associated pairs comprise what Pengyun et al. (2013) called a double process. In their study, Pengyun et al. (2013) stated the two processes as follows: "One is acquiring items that have not yet been learned well enough to be retrieved. The other is consolidating items that have already been acquired" (p. 2). Therefore, the individual has to first recognize and encode the information acquired, which in this case would be the word pair. Second, the individual has to be able to reclaim and restate the information, which in this case includes restating and identifying the missing word once presented with one of the words in the pair.

Sadalla and Loftness (1972) conducted a research study in which participants were instructed to create images with emotional words to assess paired-associate learning. Similarly, to the current study, Sadalla and Loftness (1972) used paired words from the Paivio, Yuille, and Madigan word list (p.295). The participants were given instructions as to how to associate the emotional words and how to employ mnemonic strategies with the different emotional words. Different instructions were given for each of the three different emotional valence conditions, which included a neutral condition, a positive, and a negative condition. Sadalla and Loftness (1972) found that "instructions to create 'emotional' associations lead to the construction of a sequence of cognitive elaborations which are later recalled more easily and with greater rated clarity" (p. 297). The results of Sadalla and Loftness suggest that the use of mnemonic strategies facilitates paired-

associate learning. However, the likelihood of participants using a mnemonic device without prior instructions is undetermined.

A recent study by Pierce and Kensinger (2011) describe that "there may be special mechanisms at work when information is both high in arousal and also negative in valence" (p. 141). However, Pierce and Kensinger (2011) did not take into consideration the level of imagery of the word pairs. Their study asked students from a university setting to identify pairs of words that were either intact, arranged into new pairs, or were a new pair (a pair that the participants were not previously exposed to). Pierce and Kensinger (2011) considered factors such as familiarity, frequency, concreteness, and imageability (p. 140). Pierce and Kensinger took an interesting approach; they instructed the participants to associate the words by quietly forming a sentence that included both words. They also instructed the participants to rate the difficulty of the task as the sentence was elaborated. They did not take into consideration the time it took for the participants to identify or recall the correct response. However, between the administrations of conditions, an interval of 15 minutes was used to complete a maze task to distract the participants. In their study, Pierce and Kensinger (2011) report that "Negative valence has been shown to restrict attention to local features while positive valence has been shown to broaden attention and to encourage more global processing" (p. 141). Thus, valence has been shown to influence the learning ability.

This Paired-Associate Learning study manipulates the dimension of emotionality, wherein it hypothesizes that emotionally valanced pairs with an abstract response word would be learnt quicker as compared to neutral paired associates with an abstract response word.

1.3 PROBLEM OF THE STUDY

To study the effect of emotionally valent content on paired associate learning.

1.4 HYPOTHESES

- **Null :** There would be no difference in the learning of emotionally valent word pairs as compared to neutral word pairs i.e. the total number of trials taken to learn the emotionally valent word pairs would be the same as those taken to learn the neutral word pairs.
- **Alternate:** Word pairs from emotionally valent pairs would be learnt faster than target words from neutral pairs i.e. the total number of trials taken to learn the word pairs would be lesser for the emotionally valent word pairs as compared to the neutral word pairs.

1.5 DESIGN

Repeated Measures design with one IV having two levels

1.6 OPERATIONAL DEFINITION OF VARIABLES

1.6.1 Independent Variable (IV): Emotional valence in paired associates manipulated at two levels – Presence of emotional valence & absence of emotional valence (neutral word pairs).

1.6.2 Dependent Variable (DV): Total number of trials taken to learn all the word pairs across emotionally valent and neutral word pair conditions.

1.6.3 Control Variables (CVs):

- Total Number of word pairs presented to the participant in both conditions was 5 each.
- Word pairs presented to the participants consisted of block printed capital letters, written on 5" x 6" index cards.
- All the response words (second words in the pair) were abstract nouns(low on imagery) with seven or less alphabets.
- All response words presented to the participant in the emotionally valent condition were rated 5 and above on the emotionality index and the neutral words were rated below 2 on the emotionality index by Rubin and Friendly (1986).
- All the stimulus words (first words in the pair) were three alphabet nonsense syllables following the consonant-vowel-consonant pattern.
- Exposure time for word pairs in both conditions was 5 seconds each.

1.7 METHOD

1.7.1 Sample

Individual Data:

Name of the Test Taker (Subject / Participant Name)	Age	Gender	Class	Emotional State

Group Data:

Minimum Total of 30 participants per group (Neutral words and Emotionally valent words) (based on the number of students in class).

1.7.2 Apparatus and Materials:

- Screen
- Stationery
- Seven cards with word pairs on one side and only the stimulus word from the same pair on the other side in each of the conditions (Neutral words and Emotionally valent words).
- Metronome / stopwatch
- Record sheets
- Graphs

1.7.3 Procedure:

The E arranged the material and brought the participant in the laboratory. The participant was seated comfortably, and rapport was established. During the experiment, the word pairs were shown to the participant for each condition (5 each) separately. As the first condition began the 5 nonsense syllables- meaningful word pairs are shown to the participant one after the other for 5 seconds each. The participants were asked to read both members of the pair aloud and to continue saying them aloud and remember both members of the pair until the pair was exposed to them by the experimenter. After the initial presentation of all the 5 pair cards, the cards were shuffled to ensure a random presentation subsequently. Hereafter however, the participant is shown only the stimulus word (nonsense syllable) and asked to recall the response word (meaningful word).

If the participant correctly recalls the response word, the E proceeds to next pair. If the participant recalls incorrectly, the E presents the word pair which is on the flip side of the card, asks the participant to say it aloud and then proceeds to the next pair. The E notes the response of the participant on the record sheet and then continues the list until the participant is correctly able to recall all the response words of the pair for ___ number of consecutive trials. The same procedure is followed for the second condition.

On completion of the experiment, post task questions were asked; the participant was debriefed and escorted out of the laboratory.

Instructions

Following **instructions** were given for the first Condition, *"This is a simple experiment. In the experiment, I will present you some cards one at a time, over the screen. Each card will have a pair of words where the first word is a nonsense syllable and the other is a meaningful word. A nonsense syllable is a word with no meaning. For example, KOS. BUW. A Meaningful word is any word which has a dictionary meaning. For example, WEIGHT, LOVE* (the E shows two demo cards to the P, one from each of the conditions). *Like this I will show you some cards one at a time. Your task is to read the word aloud till I stop showing you the card over the screen. After showing*

you all the cards, I will show you cards which will have only nonsense syllables. You have to tell me the meaningful word that was paired with it. If you get it wrong, I will show you the correct pair. We will continue until you are able to give me all the correct pair of words. Have you understood? Shall we begin?".

The E shows two demo cards to the P and E conducts practice with the P with these two demo cards as per the procedure. Once the P has understood the procedure, the E begins with any one of the conditions. On completion of the first condition, E begins with the second condition. The E can choose randomly any one of the two conditions – Neutral word pair condition or Emotionally valent word pair condition. While beginning with the second condition, no practice trail is required. Practice trial of two demo cards is to be done before starting with the first condition only).

The same instructions and Procedure are followed for the second condition. *"Now I will show you another set of words, we will follow the same procedure as the first condition".*

The following precautions are taken while conducting the experiment:

- After the first presentation of cards, the E shuffled the cards before each trial to ensure random order of presentation.
- To ensure counterbalancing, half of the Experimenters in the group conducted the Neutral words condition first followed by the Emotionally valent condition and vice versa.

1.7.4 Post task Questions:

- What do you think the experiment was about?
- Which task did you find easier?
- Did you find any difference in learning the lists of words? If yes, why?

1.7.5 Debriefing

Participant was debriefed about the experiment: the purpose of the study, encouraged the participant to ask questions about the study, and allowed the experimenter to address any harm to the participant that may have resulted from their participation in the study.

1.8 ANALYSIS OF DATA

1) Record of number of trials taken by the subject to recall all the pairs given in the Neutral Condition and Emotionally valent word condition correctly was represented in Table 1.2 and Table 1.2 respectively (Individual Data).

2) Summary table of individual data of record of total number of trials taken by the subject in the Neutral Condition and Emotionally valent word condition was presented in Table 1.3 (Individual Data).

3) Record of total number of trials taken by the 20 subjects to recall all the pairs given in the Neutral Condition and Emotionally valent word condition represented in Table 1.4 (Group Data).

4) Figure 1.1 and 1.2 depicts the information given in Table 1.3 (Individual Data) and Table 1.4 (Group Data).

5) Dependent *t*-test was computed to find the difference between the total numbers of trials taken by the 20 subjects to recall all the pairs given in the Neutral Condition and Emotionall y valent word condition.

1.9 RESULTS AND DISCUSSION

Table 1.1: Record sheet of participant's trial wise performance in Neutral word-pairs condition (Condition 1).

Serial No.	**Word Pair**	**Trials** (put a tick or cross based on the participants recollection of the target word)					
Stimulus Cards		1	2	3	4	….	Total No. of Trials Taken
1	SIH – VALUE						
2	KAZ - HOUR						
3	GOX – COPY						
4	CIH – DELAY						
5	LOJ - SKILL						
Total no. of correct responses							

Table 1.2: Record sheet of participant's trial wise performance in Emotionally valent word-pairs condition (Condition 2).

Serial No.	**Word Pair**	**Trials** (put a tick or cross based on the participants recollection of the target word)					
Stimulus Cards		1	2	3	4	….	Total No. of Trials Taken
1	LIJ- BRAVE						
2	KIY – PAIN						
3	VEC – MOOD						
4	GOH – ANGER						
5	ZOD – HOPE						
Total no. of correct responses							

Table 1.3: Total number of trials taken in both conditions

	Neutral Pairs (Condition 1)	**Emotionally Valent Pairs (Condition 2)**
Total number of trials taken		

Table 1.4: Total number of trials taken by 20 participants across both conditions

Participant number	**Total trials taken in Neutral Pairs condition (Condition 1)**	**Total trials taken in Emotionally Valent Pairs condition (Condition 2)**
1		
2		
3		
4		
.		
20		
Total		
Mean		
SD		

Graph 1.1: Bar Graph indicating the total number of trials taken by the participant to learn the word pairs across both conditions

Graph 1.2: Bar Graph indicating the total number of trials taken by 30 participants to learn the word pairs across both conditions

Statistical Analysis: The E used the group data to calculate the mean score on both conditions and tested the significance of the mean difference using a Dependent *t*-test.

The presented experiment was conducted to study the effect of emotionality of material on verbal learning using the paired associate method of presentation. In the experiment, the participant was presented two types of pairs of stimulus and response words. In the first condition the response words were neutral in nature and in the second condition the response words had an emotional valence. The experiment utilized a repeated measures design with one IV having two levels. It was expected that trials taken to learn the emotionally valent word pairs would be lesser than the trials taken to learn the emotionally neutral word pairs.

Individual Data

Table 1.1 depicts the performance of the participant in the emotionally neutral word pairs condition, in terms of number of trials taken by the participant to learn the list. From the table, it can be seen that the participant took _____ trials to give the response words correctly for all the stimulus words, with trial number ___ being the successive errorless trial. The participant found it difficult to recall _____ (mention ONLY IF the participant took more trials to recall any particular word).In the post task questions the participant expressed that _____ (mention the participant's experience while recalling the response words).

Table 1.2 depicts the performance of the participant in the emotionally valent condition, in terms of the number of trials taken by the participant to learn the list. From the table, it can be seen that the participant took _____ trials to give the response words correctly for all the stimulus words, with trial number ___ being the successive errorless trial. The participant found it difficult to recall _____ (mention ONLY IF the participant took more trials to recall any particular word).In the post task questions the participant expressed that _____ (mention the participant's experience while recalling the response words).

Table 1.3 is the summary table of the participants performance in both the conditions. The participants took ____ trials to learn the emotionally neutral word pairs and ____ trials to learn the Emotionally valent word pairs. There is ____ number of difference in the performance of the participant while learning the emotional and neutral word pairs. (marginal difference if difference of 1 trial, difference 2 or more than 2 difference, huge difference 4 or more than 4 trials). Since the number of trials taken to learn the emotionally neutral word pairs are less than concrete words and abstract word pairs, the results are in line with the hypothesis, which states that, _____ (mention the hypothesis) (not in line if the abstract took less trials than concrete).

The obtained data was graphically represented in Graph 1.1 for individual data and Graph 1.2 represented the average performance of the group. Discuss which of the bars is taller and shorter and what that indicates with respect to the hypothesis.

Similarly discuss the trends in the group data and elaborate on what the results of the t test indicate about the assumption made in the hypothesis.

1.10 CONCLUSION

The obtained data validates the hypothesis which states that ' _____' both at individual and group level (If individual data does not support the hypothesis, mention that the individual data does not support the hypothesis).

Appendix

Serial Number	Neutral word Pairs	Emotionally Valent Word pairs
Demo Word	KOS - WEIGHT	BUW - LOVE
1	SIH – VALUE	LIJ- BRAVE
2	KAZ - HOUR	KIY – PAIN
3	GOX – COPY	VEC – MOOD
4	CIH – DELAY	GOH – ANGER
5	LOJ - SKILL	ZOD – HOPE

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2

EXPERIMENT ON MOTIVATION

Unit Structure :

2.0 OBJECTIVES

At the end of this unit, learner should be able to –

- Understand the concepts of drives and motives.
- Identify Intrinsic and Extrinsic Motivation.
- Evaluate the various theories of motivation.
- Identify the IV, DV, and CVs in an experiment.
- Understand the various concepts of this experiment.
- Explain the results in relation to the hypothesis of this experiment.

2.1 TITLE

Effect of Social Comparison on Performance motivation

2.2 INTRODUCTION

The basic idea behind evolutionary psychology is that genetic mutations can change an organism's behavioural as well as physical characteristics. These mutations in behavioural traits, like physical traits, may help the organism reproduce, allowing the mutations to be passed on to the next generation. Individuals are thus encouraged to engage in behaviours that maximise their genetic fitness. From an evolutionary point of view, behaviours are instinctual and based on what is most advantageous in terms of passing on one's genes to the next generation. William James (1842–1910) was a key figure in early research into motivation and is widely regarded as the father of psychology in the United States. James proposed that behaviour was motivated by a variety of survival instincts.

The term motivation is derived from the Latin word "*movere*", meaning "*to move*." Motivation is the activation or energization of goal-directed behaviour. It describes the desires or needs that direct behaviour toward a goal. It is also referred to as a driving force that initiates and directs behaviour. It is a type of internal energy that motivates a person to act in order to achieve a goal. The term is typically applied to humans, but it can theoretically be applied to the causes of animal behaviour as well.

The majority of our everyday explanations for behaviour are based on motives. Why do you attend school or college? There could be a variety of reasons for this behaviour, such as wanting to learn or make friends, needing a diploma or degree to get a good job, wanting to please your parents, and so on. Some combination of these and/or other reasons would explain why you chose to pursue higher education. Motives can also be used to make predictions about behaviour. If a person has a strong desire to succeed, he or she will work hard in school, sports, business, music, and many other situations. As a result, motives are the general states that allow us to predict behaviour in a variety of situations. In other words, motivation is one of the factors that influence behaviour. The broad category of motivation includes instincts, drives, needs, goals, and incentives.

2.2.1 Drives and Motives

Motivations are commonly classified as drives and motives. Thirst, hunger, sleepiness, and the need to reproduce are all biological drives that lead us to seek out and participate in certain activities. Drives are thought to come from within a person and may not require external stimuli to encourage behaviour. Work, family, and relationships, on the other hand, are primarily driven by social and psychological mechanisms. They include elements such as praise and approval.

Stimulation and deprivation can both be used to manipulate drives and motives. Uncomfortable or aversive conditions or events (such as shocks,

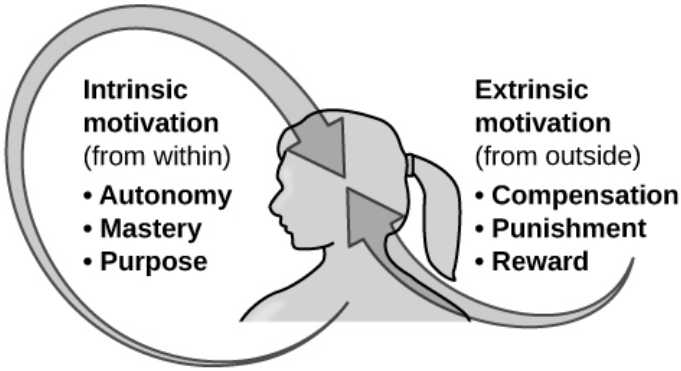
loud noise, or extreme heat or cold) can motivate us to seek better conditions, as can attractions to positive or pleasurable conditions or events (such as food or sex). When we are deprived of something we want or need, such as adequate nutrition or social contact, we become motivated.

2.2.2 Intrinsic and Extrinsic Motivation

Motivation can be intrinsic (derived from within) or extrinsic (derived from external factors). The sense of personal satisfaction that intrinsically motivated behaviours provide is what drives them. They are motivated by a personal interest or enjoyment in the task at hand, rather than by societal pressures. For example, you are intrinsically motivated if you are in college because you enjoy learning and want to become a more well-rounded individual. Intrinsic motivation is an important factor in cognitive, social, and physical development; intrinsically motivated individuals are more likely to perform well and improve their skills at a given task.

Extrinsically motivated behaviours, on the other hand, are carried out in order to receive something from others. They do not originate within the individual, but rather from society—from other people. Employees, for example, may do their work because they want to be paid by the company, rather than because they enjoy the work. Many athletes are motivated by the desire to win, to outperform their opponents, and to receive fan acclaim; they are not motivated by the intrinsic satisfaction they derive from participating in sports. Similarly, if you are in college to improve your marketability for a high-paying job or to meet your parents' expectations, your motivation is more extrinsic in nature.

Figure 2.1 : Intrinsic and Extrinsic motivation



Source: From "*Motivation*" by Lumen – Boundless Psychology. https://courses.lumenlearning.com/wsu-sandbox/chapter/motivation/#Figure_10_01_Motivation .Copywrite by Lumen Learning.

In reality, our motivations are frequently a combination of intrinsic and extrinsic factors, and the composition of the mix can shift over time. For example, say one of your favourite hobbies is cooking: you enjoy cooking for others whenever you get the chance, and you can easily spend hours in the kitchen. You have an innate desire to cook. Then you decide to attend culinary school in order to work as a chef in a good restaurant. You are now

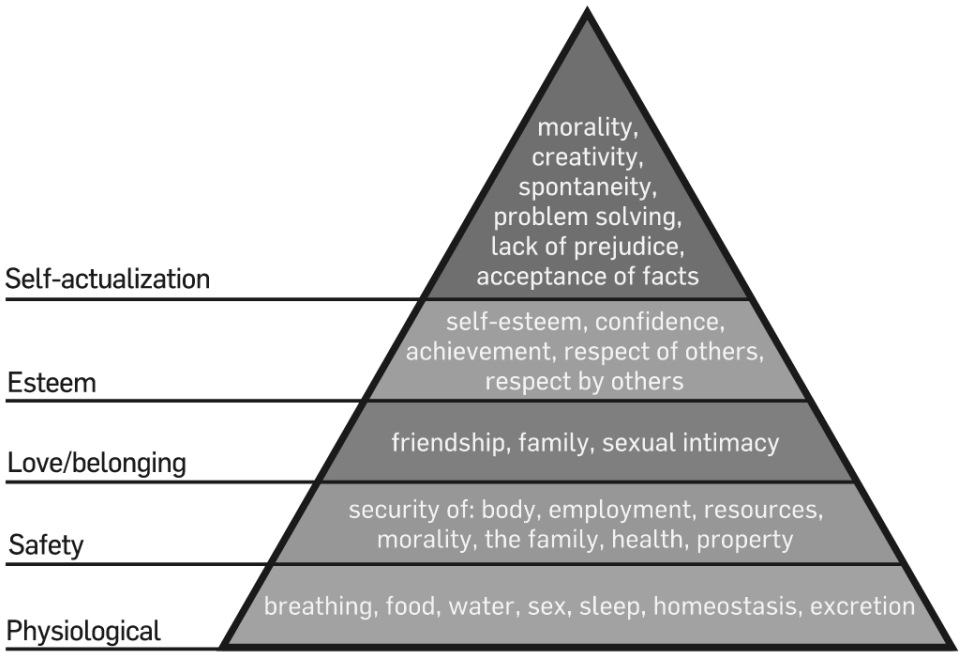
receiving extrinsic reinforcement (e.g., being paid) for your work, and you may become more extrinsically motivated than intrinsically motivated over time. The over justification effect occurs when intrinsic motivation is reduced when extrinsic motivation is provided. This can result in the extinguishment of intrinsic motivation and a dependence on extrinsic rewards for continued performance.

2.2.3 Theories of Motivation

There are several motivation theories. Older motivation theories held that rational thought and reason were the guiding factors in human motivation; however, psychologists now believe that motivation may be rooted in basic impulses to maximise well-being, minimise physical pain, and maximise pleasure.

i. **Abraham Maslow's need hierarchy theory –** This is one of the most widely discussed theories. The theory is based on a simple premise: humans have hierarchically ranked needs. There are some needs that are universal to all humans, and if they are not met, nothing else matters. We are ruled by our needs until they are met. When we have met our basic needs, they no longer serve as motivators, and we can move on to higher-order needs. Maslow organised human needs into a pyramid that includes physiological, safety, love/belonging, esteem, and self-actualization needs (from lowest to highest level). According to Maslow, lower-level needs must be met before higher-level needs can be addressed. For example, if someone is starving, it is quite unlikely that he will spend a lot of time, or any time at all, wondering whether other people think he is a good person. Instead, all of his efforts are focused on finding something to eat.

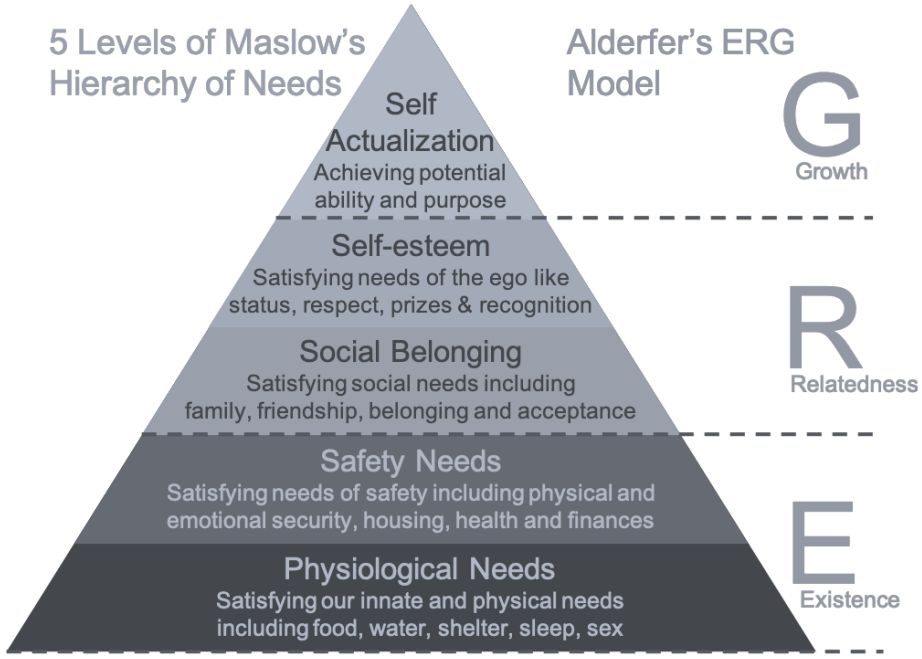
Figure 2.2 : Maslow's need hierarchy theory



Source: Adaptation from Maslow (1943). *A theory of human motivation*.

ii. **Alderfer's ERG Theory of Motivation** - Clayton Alderfer expanded Maslow's hierarchy of needs into the ERG model, a three-factor model of motivation. The letters E, R, and G in this model each represent a different human need: existence, relatedness, and growth. The ERG model is a motivational content theory. According to this model, these three needs motivate all humans. Existence is the most concrete and motivating of Alderfer's three needs, as it relates to physical and psychological survival. The need for relatedness, a sense of community, and a positive relationship with oneself is the next level. Growth is the least concrete, but most important, of Alderfer's needs in the ERG model, as it relates to self-development, fulfilment, and a sense of accomplishment. According to this theory, individuals can be motivated by multiple levels of need at the same time and the level that is most important to them can change over time. In other words, an individual's priorities and motivations can shift over time, switching between the existence, relatedness, and growth levels of need. They can move both upwards and downwards.

Figure 2.3 : Comparing Alderfer and Maslow



Source: From "*Alderfer's ERG Theory of Motivation*: *A Simple Summary*" by the World of Work of Project. https://worldofwork.io/2019/02/alderfers-erg-theory-of-motivation/ . Copyright 2018 - 2021 by the World of Work Project CIC.

According to Maslow's Hierarchy of Needs, individuals must satisfy one level of needs before moving on to the next in. They must, for example, have satisfied their safety needs before being motivated by social belonging. Alderfer strongly opposed this. According to his model, individuals do not need to have satisfied their existence needs before being motivated by their relatedness need. In fact, Alderfer went so far as to say that different people may prioritise their needs in different orders based on their life perspectives. A common example

of this is the starving actor who is motivated by growth through their art, even if it means sacrificing their existence (i.e. they can't pay their rent but are pursuing their passion). Alderfer also mentioned that how people perceive their progress in relation to each level of need is important. If a person believes they are making significant progress in relatedness, they may become increasingly motivated by growth even if their relatedness need has not been fully met. Similarly, if a person is dissatisfied with the progress they are making in terms of growth, they may abandon it and redouble their motivation in terms of relatedness.

iii. **Goal theory -** Goal-setting theory states that setting specific and measurable goals is more effective than setting vague goals. This theory was developed by Edwin A. Locke in his 1968 article "Toward a Theory of Task Motivation and Incentive." Locke emphasised the importance of setting clear goals as well as the fact that people work well when they are faced with difficult goals. Tackling these more difficult goals forces people to work hard and develop their skills, and as a result, they receive positive feedback and a sense of accomplishment.

iv. **The Drive Reduction theory** - Clark Hull pioneered the drive-reduction theory in 1943. Deviations from homeostasis, according to this theory, result in physiological needs. These needs generate psychological drive states, which direct behaviour to meet the need and, eventually, return the system to homeostasis. When a physiological need is not met, a negative state of tension is created; when the need is met, the drive to meet that need diminishes and the organism returns to homeostasis. In this sense, a drive can be viewed as an instinctual need with the ability to motivate behaviour. Humans are motivated to satisfy physiological needs in order to maintain homeostasis, according to drive-reduction theory. The Drive Reduction theory grows out of the concept that we have certain biological drives such as hunger. As time passes the strength of the drive increases if it is not satisfied. Upon satisfying a drive, the drive's strength is reduced. The theory is based on diverse ideas from the theories of Freud to the ideas of feedback control systems. For example, if it’s been a while since you ate, your blood sugar levels will drop below normal. Low blood sugar induces a physiological need and a corresponding drive state (i.e., hunger) that will direct you to seek out and consume food. Eating will eliminate hunger, and, ultimately, your blood sugar levels will return to normal. The role of habits in the type of behavioural response that we engage in is also emphasised by drive-reduction theory. A habit is a pattern of behaviour in which we engage on a regular basis; once we have engaged in a behaviour that successfully reduces a drive, we are more likely to engage in that behaviour whenever we are confronted with that drive in the future (Graham & Weiner, 1996).

v. **Cognitive Dissonance theory** - According to Leon Festinger's Cognitive Dissonance Theory, an individual experiences discomfort as a result of an incompatibility between two cognitions. Thus, cognitive dissonance occurs when a person's cognitions experience conflict, contradiction, or inconsistency. These contradictory cognitions can take the form of attitudes, beliefs, or awareness of one's own behaviour. When there is a mismatch between one's self-concept and one's behaviour, dissonance is at its peak. If you do something you are ashamed of or act in a way that contradicts a belief you have about yourself (for example, if you believe you are an honest person but then lie to your parents about your future plans), you are likely to experience cognitive dissonance.

According to cognitive dissonance theory, people have a motivational drive to reduce cognitive dissonance by changing or justifying their attitudes, beliefs, and behaviours. The strength of various motivating factors influences how a person chooses to respond to dissonance. For example, smoking cigarettes increases the risk of cancer, which threatens the individual's self-concept. When a smoker hears evidence that smoking may cause cancer (cognitive component), he or she can choose to quit smoking (change the behavioural component) or reject the causal link. Because smoking is physically addictive, most smokers prefer to downplay their awareness of the risk rather than change their behaviour. Because the addiction is more motivating than the possibility of long-term medical consequences, the less motivating idea is minimised and discounted. Most of us believe we are intelligent and rational, and the thought of doing something self-destructive causes cognitive dissonance. Smokers may make excuses for themselves, such as "I'm going to die anyway, so it doesn't matter," to alleviate this uncomfortable tension.

Another example of cognitive dissonance in action is effort justification. When people voluntarily engage in an unpleasant activity in order to achieve a desired goal, they create dissonance; this dissonance can be reduced by exaggerating the desirability of the goal. The more time, money, or effort someone puts into an activity, the more likely they are to convince themselves that they made the right decision and that their efforts were worthwhile. A child who has to work and save for a bicycle, for example, will value it more and take better care of it than a child who receives a bicycle as a gift with no effort on the child's part.

vi. **Social comparison** - Leon Festinger, a social psychologist, proposed the theory of social comparison in 1954. This theory explains how people assess their own opinions and desires by comparing them to others. Humans have a strong desire to evaluate themselves. People are constantly assessing themselves and others in areas such as attractiveness, wealth, intelligence, and success. According to some studies, as much as 10% of our thoughts involve some kind of comparison. The idea behind social comparison theory is that people determine their own social and personal worth based on how they

compare to others. Later research has revealed that people who compare themselves to others may find motivation to improve, but they may also experience feelings of deep dissatisfaction, guilt, or remorse, and engage in destructive behaviours such as lying or disordered eating.

Direction of Social Comparison- *The following are the main types of comparisons that exist in social comparison:*

- **Upward social comparison** - Occurs when individuals compare themselves to others who are socially above them in some way. People intentionally compare themselves to others in order to improve their self-esteem. It is beneficial ***for self-improvement*** because it is informative, but it is demoralising because it shows that one is not performing as well as another. As an example, consider an amateur swimmer comparing his or her lap time to that of an Olympic swimmer. When we engage in upward social comparison, we are comparing ourselves to someone who is (perceived to be or performs) better than us. When given the option, people prefer to compare themselves upwards rather than downwards.

- **Downward comparison** – Are comparisons of oneself to another person whose characteristics, outcomes, or emotional states are worse than one's own. i.e. the comparison target is more disadvantaged, inadequate, or distressed in terms of motivation than oneself. When we engage in downward social comparison, we are comparing ourselves to someone who is (perceived to be or performs) worse than us. Furthermore, the motivational underpinnings of downward comparisons are widely accepted to be the desire to feel good about oneself - in other words, ***self-enhancement.*** Comparing one's exam grade to that of a fellow student who received a lower grade. In general, this type of comparison makes one feel better about himself/herself. People who are low on self-esteem are more likely to make negative comparisons (Wills, 1981). According to research, individuals can be affected negatively or positively by downward comparisons.

- **Lateral comparisons** - Comparisons of oneself to someone whose personal qualities, attributes, or outcomes are similar to one's own. Because similar others are constructed as being most informative for self-evaluation, lateral social comparisons have been viewed as the most common and useful to an individual. It is ideal for ***self-evaluation***. However, because lateral comparisons are easier to operationalize in the lab than in the real world, there is little real-world support for the importance of lateral social comparisons.

Table 2.1 : Examples of Upward and Downward Comparisons -

Comparisons concerning…	Upward social comparisons	Downward social comparisons
Performance in Sport	My next-door neighbour motivates me. If he can complete a half-marathon, so can I.	I'm pleased that I beat my neighbour in the half-marathon.
Physical appearance	My friend reached her weight-loss goal. If she can do it, so can I.	At the very least, I don't consume as much alcohol as some of my friends.
Workplace performance	My co-worker is always able to balance work and life. That is something I hope to accomplish.	My other colleague's situation reminds me to better plan my work so that I am not in the same situation as they are.
Intelligence	My friend is more intelligent than I am. She simply understands.	My colleague constantly struggles with the same topics, whereas it just clicks for me.
Relationships	Couple Z makes it appear to be so simple. Unlike us, they get along so well and never fight.	When I see couple X argue, it reminds me to be thankful for my own relationship. It could be much worse!
Money	I want to work hard in order to earn the same salary as my boss.	He was laid off before he knew it. At the very least, I have a job, but that could change at any time.

Source : Nortje, A. (2022)

2.3 PROBLEM OF THE STUDY

To study the effect of upward social comparison on motivation.

2.4 HYPOTHESIS

- Null Hypothesis: There would not be a difference in the motivation to perform between upward social comparison situation and no social comparison situation i.e.
    - There would not be a difference in the mean correct responses between upward social comparison situation and no social comparison situation.

- There would not be a difference in the mean RT between upward social comparison situation and no social comparison situation.

- Alternate Hypothesis: Motivation to perform is higher in case of upward social comparison situation as compared to no social comparison situation i.e.
  - The mean correct response is higher for upward social comparison situation as compared to no social comparison situation.
  - The mean RT is lower for upward social comparison situation as compared to no social comparison situation.

2.5 DESIGN

Random group design with one independent variable having two levels.

Group	**Situation**
Experimental Group (EG)	Upward Social Comparison
Control Group (CG)	No Social Comparison

2.6 OPERATIONAL DEFINITIONS OF VARIABLES

2.6.1 Independent Variable:-

Upward social comparison situation was manipulated at two levels for the Ss while performing the task –

- Presence of upward social comparison (Experimental Group) and
- Absence of any social comparison (Control Group).

2.6.2 Dependent Variable

Performance motivation measured in terms of

1) Correct responses given by subject to mathematical problem paired with the figure
2) Time taken to correctly calculate and respond to mathematical problem paired with the figure i.e. Reaction Time (in seconds).

2.6.3 Control Variables:

1) 16 sums would be formed that have 4 addition, 4 subtraction, 4 multiplication and 4 division problems that are presented in random order.

2) Stimulus cards would be prepared in such a way that each representation of a figure will be paired with each type of mathematical sign across the 4 sets.

3) In each set, 16 playing cards are used out of which 8 will be club, spade, heart and diamond.

4) Two stimulus cards depicting the same mathematical relationship would not be presented successively.

5) The E will present the stimulus card and start the stopwatch simultaneously with the same precision across all the problems.

6) The RT for each problem will be accurately recorded.

7) Exposure time for each stimulus card is 5 seconds.

8) Participants' response will be considered invalid if their RT exceeds 90 seconds.

2.7 METHOD

2.7.1. Sample

Individual Data:

Subjects (Ss)	**Name of the Test Taker (Subject / Participant Name)**	**Age**	**Gender**	**Class**	**Emotional State**
ES					
CS					

Group Data:

Minimum Total of 30 = 15 per group (EG, CG) (based on the number of students in class, equally divide the class into two equal groups – EG and CG)

2.7.2 Apparatus and Materials:

1) 16 stimulus cards.

2) 4 practice cards.

3) Deck of playing cards containing only number cards.

4) Stopwatch

5) Screen

6) Record sheet each for EG and CG

7) Stationery.

2.7.3 Procedure:

The class was divided into two equal groups. One half received the experimental condition whereas the other half received the controlled condition. Based on the condition the Experimenter received, instructions for the Subject were given.

The E arranged the materials and called the S in the lab. The S was made to sit at a distance from which he/ she could respond. Rapport was built and the following instructions were given.

Instructions for Control Subject (CS).

"This is a simple experiment on mathematical problem solving. I will give you a shuffled deck of playing cards in your hand which you should hold upside down. After that I will say ready and then I will present a set of stimulus cards one at a time over the screen for 5 seconds. Each stimulus card has a mathematical problem and a figure on it. The problem will be one of the following – addition (+), subtraction (–), multiplication (x) or division (÷) [show practice card 1]. The figure will be one of the following heart ♥, club ♣, spade ♠ and diamond ♦ [show practice card 1]. You must solve the problem orally, pair it with a figure and then pick a card from a deck and show me. For example:- If the card shown to you is 1+6 followed by spade, then you pick 7 of spade [show practice card 1]. You must respond as quickly as you can as you will be timed from the moment the card is exposed till you show me the card. Remember I will shuffle the deck for every problem. In case your reaction time exceeds 90 seconds, then your response will be considered invalid. According to your correct response and minimum reaction time you will be scored. Have you understood? Shall we begin?".

Instructions for Experimental Subject (ES).

"This is a simple experiment on mathematical problem solving. I will give you a shuffled deck of playing cards in your hand which you should hold upside down. After that I will say ready and then I will present a set of stimulus cards one at a time over the screen for 5 sec. Each stimulus card has a mathematical problem and a figure on it. The problem will be one of the following – addition (+), subtraction (–), multiplication (x) or division (÷) [show practice card 1]. The figure will be one of the following heart ♥, club ♣, spade ♠ and diamond ♦ [show practice card 1]. You must solve the problem orally, pair it with a figure and then pick a card from a deck and show me. For example:- If the card shown to you is 1+6 followed by spade, then you pick 7 of spade [show practice card 1]. You must respond as quickly as you can as you will be timed from the moment the card is exposed till you show me the card. Remember you will shuffle the deck for every problem. In case your reaction time exceeds 90 seconds, then your response will be considered invalid.

Try to give the response in minimum time as you will be ranked by comparing your score with the score of 20 other volunteers who have

mastered this task and have successfully completed the task in minimum time because with each stimulus card, their response speed increased. When the card was shown to them, each time they were alert and quick in calculating the mathematical problem shown to them and remembered the answer with a figure very well while searching the response card from the deck and correctly gave the response card in minimum time. If they have done it in minimum time, then certainly you can also accomplish it with a higher possible rank. Have you understood? Shall we begin?".

2.7.4 Post task Questions:-

- How did you find the experiment?
- Do you have any questions or comments about this experiment?
- In EG condition only:
    - What were your thoughts when I told you about 20 other volunteers who have mastered the task in minimum time?
    - Did that motivate you?
    - Did you pressurise you or did it affect your performance negatively?

(more questions could be added based on the discussion in class with the teacher.)

2.7.5 Debriefing :-

In a "debriefing", experimenter explains the purpose of the study, explains the use of deception (if any was used), encourages the participant to ask questions about the study, and allows the experimenter to address any harm to the participant that may have resulted from their participation in the study.

Subjects were informed about the purpose of the experiment. In EG condition, subjects were told that the comparison of subject's scores to be ranked according to the example given to them about 20 volunteers who had mastered this task was a hypothetical condition used in this experiment and the purpose of using this example in creating the upward social comparison situation was informed to them.

2.8 ANALYSIS OF DATA

1) Record of number of problems correctly solved and Mean RT (in seconds) taken to solve problems correctly by both the Ss – ES and CS was represented in Table 2.2 and Table 2.3 respectively for ES and CS (Individual Data).

2) Summary table of individual data of record of number of problems correctly solved and Mean RT (in seconds) was presented in Table 2.4 (Individual Data).

3) Record of number of problems correctly solved by both the groups – EG and CG and Mean RT (in seconds) taken to solve problems correctly by both the groups – EG and CG was respectively represented in Table 2.5 and Table 2.6 (Group Data).

4) Figure 2.4 and 2.5 depicts the information given in Table 2.3 (Individual Data) and Figure 2.6 and 2.7 represents the information given in Table 2.5 and Table 2.6 (Group Data).

5) Two independent *t*-tests were computed for both the numbers of problems correctly solved by both groups (EG and CG) and for time taken (in seconds) to solve the problems by both groups (EG and CG).

2.9 RESULTS AND DISCUSSION

Motivation is a driving force that initiates and directs behaviour. Social comparison explains how individuals evaluate their own opinions and desires by comparing themselves to others. The purpose of the experiment was to study the effect of social comparison on motivation. It was a random group design with one independent variable as upward social comparison (USC), having 2 levels as presence of USC and absence of USC. This experiment included two DVs: number of correct responses and mean reaction time.

This section would describe individual results and group results. Firstly, explain the results of individual data. Use the table given below (Table 2.2) to make a note of the responses given by the participant (Subject). Once all the responses have been noted down, calculate the total and mean. Unique observations (ease of the task, doubts or questions raised during debriefing, etc…) made during the experiment can be noted down here.

Table 2.2 depicts an individual data for experimental subject. Total correct responses of the subject were ____ and total reaction time (in seconds) taken to give correct responses was ____ seconds.

Table 2.3 describes an individual data for control subject. Total number of correct responses of the subject were ____ and mean reaction time (in seconds) taken to give correct responses was ____ seconds.

Table 2.4 shows the summary table of the individual data. As it can be seen from the table that correct responses were higher in case of _____ condition as compared to the _____ condition, thus, the null/alternate hypothesis is accepted. Whereas, mean RT is found to be lower in case of _____ condition as compared to _____ condition, thus, the null/alternate hypothesis is accepted.

Table 2.5 represents a Group Data depicting a record of number of problems correctly solved by both the groups – EG and CG. As it can be seen from the table that correct responses were higher in case of _____ condition as compared to the _____ condition.

Table 2.5 shows a Group Data representing Mean RT (in seconds) taken to solve problems correctly by both the groups – EG and CG. As it can be seen from the table that mean RT is found to be lower in case of _____ condition as compared to _____ condition.

[Note for students about Group Data: Since this experiment was a random group design with two levels of one IV, an Independent t-test will be used for each of the DV. Explain results obtained post collection of group score. Mean, standard deviation and Independent t-test would be calculated and mentioned in this section. Once the t test is conducted based on the finding, it would have to be mentioned if the results supported the hypothesis or rejected. Explain these results with past research findings.]

Table 2.2 :- Individual data for Experimental Subject (Es)

Sr. No	**Stimulus Card**	**Correct Response**	**S's Response**	**√ Or X**	**Reaction Time (RT)**		**Converted RT**
					(Sec.)	**(M.Sec.)**	**(Sec.)**
P 1	1+6 ♠ =	7 ♠					
P 2	6÷2 ♦ =	3 ♦					
P 3	5 – 1 ♥ =	4♥					
P 4	3 x 1 ♣ =	3♣					
1.	1 x 9 ♦=	9♦					
2.	7+0♠ =	7♠					
3.	9 – 3 ♣=	6♣					
4.	1 x 3 ♥=	3♥					
5.	8 ÷ 2♦ =	4♦					
6.	2 – 0 ♠=	2♠					
7.	3 x 2 ♣=	6♣					
8.	16÷ 4 ♥=	4♥					
9.	5 – 1♠ =	4♠					
10.	1 x 5♦ =	5♦					
11.	8 ÷ 4♣ =	2♣					
12.	7 + 1 ♠=	8♠					
13.	10 – 8 ♥=	2♥					
14.	6 + 2♣ =	8♣					
15.	20 ÷ 5♦=	4♦					
16.	1 + 7 ♥ =	8♥					
			Total				
						Mean RT	

(Sec. = Seconds, M. Sec. = Milliseconds, RT = Reaction Time).

Table 2.3 :- Individual data for Control Subject (Cs)

Sr. No	Stimulus Card	Correct Response	S's Response	√ Or X	Reaction Time (RT)		Converted RT
					(Sec.)	(M.Sec.)	(Sec.)
P 1	1+6 ♠ =	7 ♠					
P 2	6÷2 ♦ =	3 ♦					
P 3	5 – 1 ♥ =	4♥					
P 4	3 x 1 ♣ =	3♣					
1.	1 x 9 ♦=	9♦					
2.	7+0♠ =	7♠					
3.	9 – 3 ♣=	6♣					
4.	1 x 3 ♥=	3♥					
5.	8 ÷ 2♦ =	4♦					
6.	2 – 0 ♠=	2♠					
7.	3 x 2 ♣=	6♣					
8.	16÷ 4 ♥=	4♥					
9.	5 – 1♠ =	4♠					
10.	1 x 5♦ =	5♦					
11.	8 ÷ 4♣ =	2♣					
12.	7 + 1 ♠=	8♠					
13.	10 – 8 ♥=	2♥					
14.	6 + 2♣ =	8♣					
15.	20 ÷ 5♦=	4♦					
16.	1 + 7 ♥ =	8♥					
			Total				
						Mean RT	

(Sec. = Seconds, M. Sec. = Milliseconds, RT = Reaction Time).

Table 2.4: Summary Table of Individual Data – Total number of correct responses and Mean Reaction Time (RT) in both conditions.

	ES	CS
Total number of correct responses		
Mean RT		

Table 2.5: Group Data – Total number of correct responses (*N* = 20)

Ss	**EG**	**CG**
1		
2		
3		
4		
So on……		
TOTAL		
MEAN		
S.D		

Table 2.6 : Group Data - Mean RT (*N* = 20)

Ss	**EG**	**CG**
1		
2		
3		
4		
So on……		
TOTAL		
MEAN		
S.D		

2.10 CONCLUSION

The conclusion should summarize the key themes / arguments of the experiment. Your conclusions summarize how your results support or contradict the hypothesis. Suggest the key takeaways from this experiment.

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3

EXPERIMENT ON MEMORY

Unit Structure :

3.0 OBJECTIVES

At the end of this unit, learner should be able to –

- Understand the concepts of memory
- Understand the concepts of Production Effect.
- Evaluate the various researches conducted to study Production Effect.
- Identify the I.V, D.V and CVs in an experiment
- Describe the Experimental design and various concepts related to this experiment
- Understand the various concepts of this experiment.

- Explain the results in relation to the hypothesis of this experiment.

3.1 TITLE

The Production Effect on Memory of Words

3.2 INTRODUCTION

3.2.1 Memory

Over the last few decades, memory has been defined in various ways by multiple theorists. However, irrespective of the myriad definitions, all theorists seem to agree on memory comprising of three components i.e., Encoding, Storage and Retrieval.

Many different variables or manipulations can influence the manner in which information and stimuli are encoded and stored in memory as well as retrieved from memory. For example, generating (e.g., stem completion) or enacting (e.g., performing the action) items at study tends to produce greater memory performance than not generating (i.e., the generation effect; Slamecka & Graf, 1978; also, see Bertsch, Pesta, Wiscott, & McDaniel, 2007, for a review) or enacting items (i.e., the enactment effect; Cohen, 1981; Engelkamp & Krumnacker, 1980). In addition, studying pictures produces greater memory performance than studying words (i.e., the picture superiority effect; Paivio, 1971). Similarly, items that are processed on a deeper level (e.g., semantic processing) at study are remembered better than items that are processed on more shallow level (e.g., phonemic or orthographic processing; Craik & Lockhart, 1972). The von Restorff effect is the finding that an item that is different or isolated from the other items on the study list is better remembered (see Hunt, 1995).

3.2.2 Production Effect

One recent manipulation that has been found to affect memory is the production effect (PE). The production effect is the difference in memory favouring words read aloud relative to words read silently during study (MacLeod, Gopie, Hourihan, Neary, & Ozubko, 2010). Recent research by MacLeod and his colleagues (e.g., MacLeod et al.,2010; Forrin et al., 2012; Ozubko et al., 2012) has not only revived interest in a little-known finding from the 70s and 80s of the last century (Hopkins and Edwards, 1972; Conway and Gathercole, 1987), but it also provided a more rigorous definition of the phenomenon and delineation of the conditions under which it does and does not occur.

Everyday life entails possible instances of the PE in action. Students typically remember well those portions of the material that they had presented orally in class (but less well those portions merely summarized in their notebook). Rehearsals for stage productions typically start by oral reading of the respective texts by performers when silent reading would seem sufficient. Conversely, one often forgets an appointment despite

writing down the date in the calendar (but the appointment is remembered if one mentions it, if unwittingly, to one's spouse or a friend).

Although the study items in typical production effect researches are usually lexical in nature (e.g., single words, word pairs, sentences, paragraphs; see Ozubko, Hourihan, & MacLeod, 2012), other stimuli such as non-words (MacLeod et al., 2010; Experiment 6), and pictures (Fawcett, Quinlan, & Taylor, 2012; Richler, Palmeri, & Gauthier, 2013) also result in significant production effects. In addition, reading or naming the study item aloud tends to be the most common form of production; however, other methods have included spelling, writing, and typing (Forrin, MacLeod, & Ozubko, 2012; Richler et al., 2013); mouthing (Castel, Rhodes, & Friedman, 2013; Fawcett et al., 2012; Forrin et al., 2012; MacLeod et al., 2010); whispering (Forrin et al., 2012; see also Castel, 2009, and Castel et al., 2013); and listening to the auditory presentation of words (Forrin & MacLeod, 2016). The production effect has been most often measured using yes/no recognition, but some studies have instead included fill-in-the-blanks (Ozubko et al., 2012), forced-choice recognition (MacLeod et al., 2010), and free recall (e.g., Jones & Pyc, 2014; Jonker, Levene, & MacLeod, 2013), often following a short delay (Hourihan & MacLeod, 2008; MacLeod et al., 2010) but sometimes following a long delay (Ozubko et al., 2012) between study and test.

Many researchers (e.g., Fawcett et al., 2012; Forrin et al., 2012; Forrin & MacLeod, 2016; Ozubko & MacLeod, 2010) have argued that the production effect is best explained by a distinctiveness account, which assumes that producing an item result in a relatively more "distinct" memory trace, making produced items easier to retrieve at test compared to non-produced items (see Schmidt, 1991, and more recently, Hunt, 2006, for a review of distinctiveness). In particular, MacLeod et al. (2010) and Ozubko and MacLeod (2010) have proposed that such a distinctiveness account assumes that compared to non-produced items, produced items have at least one distinct element that is encoded at study, which serves as a retrieval cue to guide memory performance at test. For example, compared to reading silently, reading aloud consists of two additional distinct elements: articulation and audition, which are encoded at study. At test, participants can use these two distinct elements to decide whether an item was studied: If participants remember saying the word aloud and/or hearing themselves say the word aloud, they can use that information to decide that the item was presented at study. Thus, in the production paradigm, participants may use a memory heuristic (see Schacter, Israel, & Racine, 1999) whereby distinct elements that were encoded at study are used to guide retrieval at test.

While the production effect is commonly studied by comparing memory performance for items read aloud and items read silently, Forrin and colleagues (2012) extended the earlier work of MacLeod et al. (2010) by examining other forms of production. In a three-level mixed-list design, Forrin et al. (2012) found that reading aloud at study resulted in better subsequent memory than three other forms of production: writing (Experiment 2A), mouthing (Experiment 2B), and whispering (Experiment

2C) —all of which produced better memory than reading silently but worse memory than reading aloud. Forrin et al. (2012) argued that, relative to items that are read silently, memory performance is better for items that are written and mouthed because writing and mouthing each involve a distinct motor element (i.e., manual movement and articulation, respectively); there is an extra benefit for reading aloud because it involves the additional distinct element of audition. The difference in memory performance for reading aloud in a normal voice and whispering suggests dependence of the production effect on the intensity of the distinct element available in the production. Similarly, Castel (2009) found a trend (although non-significant) for a greater production effect for items read aloud loudly compared to items read 28 aloud quietly (see also Castel et al., 2013). It thus appears that cues to relative distinctiveness can be defined both qualitatively (e.g., motor, motor + audition) and quantitatively (e.g., the intensity of audition), with the effect on subsequent memory depending on the total number of available cues. While Forrin et al. (2012) showed that the magnitude of the production effect is larger for reading aloud compared to other forms of production and argued that this is related to the number and strength of the distinct elements available in the type of production, it nevertheless remains possible that there is something special about reading aloud per se that makes it a stronger cue to relative distinctiveness than other forms of production.

On the premise of Forrin et al.' s (2012) demonstration of a larger production effect for reading aloud in a normal voice compared to whispering which shows that that reading aloud loudly includes an additional distinctive element (increased intensity of vocalization and audition) over reading aloud in a normal voice, the current experiment intends to study whether distinctiveness could predict better subsequent memory for items read aloud loudly than for items read aloud in a normal voice.

3.3 PROBLEM OF THE STUDY

To study the production effect on memory for words.

3.4 HYPOTHESIS

- **Null:** There would be no difference in the recall score for words read aloud loudly, words read out in a usual voice and words read silently.
- **Alternate:** The recall score would be highest for the words read out loudly followed by the words read out in a usual voice, followed by the words read silently.

3.5 DESIGN

Repeated group design with three levels of independent variable.

Condition	Production Effect (PE)
Condition A	words read aloud loudly (PE present)
Condition B	words read out in a usual voice (PE present)
Condition C	words read silently (PE absent)

3.6 OPERATIONAL DEFINITIONS OF VARIABLES

3.6.1 Independent Variable (IV):-

Production Effect (PE) was manipulated at three levels (Read Aloud Loudly, Read in one's usual pitch, Read Silently).

Operational Definition of Independent Variable (IV)

Production effect insofar as the participant *produces* the word during the encoding stage by reading it out.

3.6.2 Dependent Variable (DV)

Recall scores of the participant across the three conditions.

Operational Definition of Dependent Variable (DV)

Recall scores indicated by a total of the words recalled by the participant in each condition, notwithstanding the order in which they were presented to them (Free recall).

3.6.3 Control Variables (CVs)

1) The total number of word-cards in each condition was the same i.e., 10 (hence, a total of 30 cards).
2) Words for each condition were written in the same font type and size, at the centre of the card.
3) Words in each condition consisted of 4-7 alphabets.
4) Words for each condition were spatial and temporal words (not concrete words).
5) All the words chosen scored below 5 on the dimensions of Meaningfulness, Imagery and concreteness (Arnold, 1979).
6) The words in the familiarization and practise phase were not temporal and spatial words.
7) Cards for each condition were of the same size 10 cm x 10 cm.
8) The cards were shuffled and presented in a random order.

3.7 METHOD

3.7.1. Sample

Individual Data:

Name of the Test Taker (Subject / Participant Name)	Age	Gender	Class	Emotional State

Group Data:

Minimum 20 participants

3.7.2 Apparatus and Materials:

1) Screen
2) Stationery
3) 10 cards each with words written in Blue (Condition A), Black (Condition B) and Green (Condition C). The participant wrote Read Loudly, read usually and read silently behind all the blue, black and green cards respectively.
4) 6 + 9 cards for the familiarization and practise phase of the study respectively
5) Stopwatch
6) Record sheets
7) Graphs

3.7.3 Procedure:

The E arranged the materials and called the S in the lab. The S was made to sit at a distance from which he/ she could respond. Rapport was built and the E explained to the S that the present experiment would have three phases after which the S would be required to complete a memory test. The three phases that were designed to ensure that the S was comfortable with the three instruction conditions (Read Aloud Loudly, Read in one's usual pitch, Read Silently) were as follows:

1. **Familiarization:** The intention of this phase was to familiarize the participant with the colour scheme of the words on the cards to be presented and the associated task of the participant. That is, the participant was instructed and demonstrated that the words in blue must be read out in a loud pitch, the words in black must be read out in the participant's usual/ regular pitch and the words in green must be read silently. Here, two demonstration cards from each colour were intermixed randomly to produce a total of 6 familiarization cards which were used by the experimenter to demonstrate and familiarise the participant with the correct study process.
2. **Practise:** This phase intended to let the participant practise on a set of practise cards which are separate from the set of 30 cards which the participant has to actually learn from in the study phase. Here 3 trials of each colour were intermixed in a random order to produce a total of 9 practise trials. The words used in each colour trial were the same to ensure that they do not lead to fatigue.
3. **Study**: immediately after the practise phase the experimenter asked if the participant was ready to read the actual list and showed the participant each of the thirty word-cards in a random order. The experimenter looked at the back of the card carefully to ensure if the production was done correctly by the participant.

Immediately after the completion of the card presentation, the experimenter handed over a sheet of blank paper to the participant and asked them to write down as many words as they remembered from the 30 cards presented to them. The participants were given a duration of 5 minutes to recall and write the words in any order whatsoever.

Instructions

The following instructions were given as per the steps.

"*This is a simple experiment on memory which involves you seeing some words that I will show you on some cards. You have to try and remember these words as I show them to you and then do a memory task."*

Familiarization Phase (Use the 6 demo cards): *"The words that you will see on the cards would be in three colours; Blue, Black and Green. Each time you see a word in the blue colour, you should read it out loudly. By that I mean in a pitch that is louder than your normal pitch while talking to people. For example…"* The Experimenter demonstrates. "*Each time you see a word in the black colour, you should read it out in your usual pitch. For example…"* The Experimenter demonstrates. "*Each time you see a word in the green colour, you should read it in your mind silently. For example..."* The Experimenter demonstrates.

Practise Phase (Use the 9 Practise cards): "*In this practise phase let us try doing what I just explained to you. Like I said, I will show you cards in three colours. Please look at the colour and try to read appropriately based on the colour. You don't have to remember these words as they are just for practise…just try to get the method of reading them right.*" The Experimenter shows the 9 practise cards and based on the instruction behind each card, ensures if the participant is reading them in the correct manner. If there is any error, the Experimenter asks the Participant to read the word again correctly.

Study Phase (Use the 30 cards): After completing the practise phase, the Experimenter immediately begins the study phase by saying, "*Now that you have understood the process of reading the cards, let us begin with your actual task. Hereafter, I will show you 30 cards with words printed on them in one of the three colours i.e. Blue, Black and Green. As you know, you have to read the word out loudly, in your normal pitch or silently based on the colour and try to remember them as you read them. After you have seen all the cards and read them, I will give you a blank sheet of paper on which you will have to write as many words as you remember seeing on the cards. You can write the words in any order. You would be given a total of 5 minutes to write down the words.*

Have you understood? Shall we begin?"

3.7.4 Post task Questions:-

- How did you find the experiment?
- Do you have any questions or comments about this experiment?

- What do you think the experiment was about?
- Did you find any difference in learning the three kinds of words? If yes, why?
- Which words did you find easier to remember? Why?
- Which words were difficult to remember? Why?

(more questions could be added based on the discussion in class with the teacher.)

3.7.5 Debriefing :-

In a "debriefing", experimenter explains the purpose of the study, explains the use of deception (if any was used), encourages the participant to ask questions about the study, and allows the experimenter to address any harm to the participant that may have resulted from their participation in the study. Here, students will prepare a debrief under the guidance of the teacher.

3.8 ANALYSIS OF DATA

1) Record of number of words correctly recalled by the S in all three conditions was represented in Table 3.1 (Individual Data).

2) Summary table of subject's free recall scores across three conditions was represented in Table 3.2 (Individual Data).

3) Total number of words recalled by 10 participants across the three conditions was represented in Table 3.3 (Group Data).

4) Figure 3.1 indicating a Bar Graph for the total number of words recalled by the subject across three conditions (Individual Data).

5) Figure 3.2 indicating a Bar Graph for the total number of words recalled by the 10 participants across three conditions (Group Data).

6) The E used the group data to calculate the mean score on the three conditions and tested the significance of the mean difference using a one-way ANOVA.

3.9 RESULTS AND DISCUSSION

The present experiment was conducted to study the production effect on memory for words. It used two kinds of production methods and contrasted those with an absence of production. In the experiment, the participant was randomly presented 30 words printed in three colours during the encoding phase, which had to be read loudly, usually or silently based on the colour. It was expected that the participant would encode the material differently based on the kind of production (or the absence of it) done as a response to the varied colours of the words. The experiment utilized a repeated measures design with one IV having three levels.

Individual Data

In the current experiment it was hypothesized that, the recall score would be highest for the words read aloud loudly followed by the words read out in a usual voice, followed by the words read silently. Thus, it was expected that production effect would enhance memory due to a distinct encoding of the material.

Table 3.1 depicts the recall performance of the participant across the three levels of the IV. From the table 3.2 indicating a summary of recall scores of the S across three conditions, as it can be seen that_____ (Report the scores on all the three kinds of encoding conditions and state if the data is as expected). The greatest number of words recalled by the participant were in _____condition and the least number of words recalled by the participant were in _____ condition. In the post task questions the participant expressed that _____ (mention the participant's experience about recalling the words).

Graph 3.1 is a bar graph depicting the participants recall performance based on the three encoding conditions. As can be seen from the graph_____(Discuss which of the bars is taller and shorter and what that indicates with respect to the hypothesis).

Thus overall it can be seen that the Individual data_____(is in line / not in line with the hypothesis).

Group Data:

Similarly discuss the trends in the group data collected from 20 participants. Talk about the highest, intermediate and lowest recall scores with respect to the encoding conditions and discuss the group data graph. Elaborate on what the results of the One-way ANOVA test indicate about the assumption made in the hypothesis.

3.10 CONCLUSION

The obtained data validates the hypothesis which states that ' _____' both at individual and group level (If individual data does not support the hypothesis, mention that the individual data does not support the hypothesis).

Appendix

Cards for the Familiarization Phase

Serial Number	Condition A (Blue)	Condition B (Black)	Condition C (Green)
1	Duck	Chair	Cloth
2	Table	Leaf	Pencil

Cards for the Practise Phase

Serial Number	Condition A (Blue)	Condition B (Black)	Condition C (Green)
1	Band	Band	Band
2	Chalk	Chalk	Chalk
3	River	River	River

Cards for the Study Phase

Serial Number	Condition A (Blue)	Condition B (Black)	Condition C (Green)
1	Until	Span	When
2	Below	Beyond	Size
3	Today	During	Future
4	Deep	Side	Bottom
5	Almost	While	Past
6	Near	Under	Tiny
7	Since	Quick	Slow
8	Above	Huge	Close
9	After	Next	Present
10	Little	Small	Middle

RECORD SHEET (For Experimenter)

Table 3.1 Record of number of words correctly recalled by the subject across three conditions (Individual Data). Put a tick-mark against the word recalled by the subject.

Sr. No.	CONDITION A (BLUE)	Put a tick-mark	CONDITION B (BLACK)	Put a tick-mark	CONDITION C (GREEN)	Put a tick-mark
1.	Until		Span		When	
2.	Below		Beyond		Size	
3.	Today		During		Future	
4.	Deep		Side		Bottom	
5.	Almost		While		Past	
6.	Near		Under		Tiny	
7.	Since		Quick		Slow	
8.	Above		Huge		Close	
9.	After		Next		Present	
10.	Little		Small		Middle	
Total		**/10**		**/10**		**/10**

Table 3.2 Summary Table of Subject's Free Recall across Three Conditions (Individual Data)

	Total (Blue) Words recalled from the 'reading out loudly' condition	Total (Black)Words recalled from the 'reading out usually'	Total (Green)Words recalled from the 'reading silently' condition
Recall scores	**/10**	**/10**	**/10**

Table 3.3: Total number of words recalled by 20 Ss across the three conditions (Group Data)

Sr. No.	Total (Blue)Words recalled from the 'reading out loudly' condition	Total (Black)Words recalled from the 'reading out usually' condition	Total (Green)Words recalled from the 'reading silently' condition
1			
2			
3			
..			
20			
Total			
Mean			
SD			

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4

EXPERIMENT ON EMOTIONS

Unit Structure :

4.0 OBJECTIVES

At the end of this unit, learner should be able to –

- Define and understand the concept of emotion.
- Understand the various theories of emotions.
- Comprehend what is emotional regulation is.
- Different points in the emotion generative process.
- Identify the I.V, D.V and CVs in an experiment
- Understand how to use Randomization and Counterbalancing
- Frame hypothesis for experiments

4.1 TITLE

Effect of emotion regulation on verbal as well as non-verbal memory

4.2 INTRODUCTION

We learned about motivation in the previous unit. Emotions are covered in this unit.

4.2.1 Motivation vs. Emotion

Motivation and emotion are commonly regarded as two psychological characteristics that appear to have a cause-and-effect relationship. While motivation and emotion are inextricably linked, they are fundamentally distinct. Motivation refers to the desires or needs that drive behaviour toward a goal; an emotion, on the other hand, is a subjective state of being that we commonly refer to as a feeling. Emotion and motivation are linked in several ways: both influence behaviour and can lead us to act, and emotion can act as a motivator in and of itself. For example, fear can motivate someone to leave a stressful situation, whereas happiness can motivate someone to be more productive on a project that reinforces that emotion.

4.2.2 What is Emotion?

Emotion is defined in psychology as a conscious and subjective experience characterised by mental states, biological reactions, and psychological or physiological expressions (e.g. facial expressions). The term "emotion" was coined in 1579 as an adaptation of the French word "*emouvoir*" which means "*to stir up"*. We all experience joy, sorrow, hope, love, excitement, anger, hatred, and other such emotions throughout the day. Emotion is frequently used interchangeably with the terms 'feeling' and 'mood'. Feeling refers to the pleasure or pain dimension of emotion, which is usually associated with bodily functions. Emotion differs from "feelings" because feelings represent emotions subjectively, which means that feelings are only private to the person. Mood is a long-lasting affective state that is less

intense than emotion. Emotion can be distinguished from ‘mood’ by the duration of their presence; a mood lasts longer than an emotion. Both of these terms are more specific than the concept of emotion. “Affect” which is interchangeably used with emotion, is the experience of emotion and is associated with how the emotion is expressed (as seen on facial expressions or hand gestures). Emotions are a multifaceted pattern of arousal, subjective feelings, and cognitive interpretation. Emotions, as we experience them, move us internally, involving both physiological and psychological responses. Emotion is a subjective feeling, and everyone's emotional experience differs.

Attempts have been made in psychology to identify basic emotions. It has been discovered that at least six emotions are felt and recognised everywhere. Anger, disgust, fear, happiness, sadness, and surprise are among them. Izard proposed ten basic emotions: joy, surprise, anger, disgust, contempt, fear, shame, guilt, interest, and excitement, with combinations resulting in other emotional blends. There are eight basic or primary emotions, according to Plutchik. All other emotions are the result of various combinations of these basic emotions. He categorises these emotions into four pairs of opposites, namely joy-sadness, acceptance, and denial. Disgust, fear-anger, and surprise-anticipation

We experience a wide range of emotions (which we commonly refer to as "feelings") as we go about our daily lives. Emotions are frequently the driving force behind motivation (whether positive or negative), and they are expressed and communicated through a variety of behaviours, including tone of voice and body language.

Our psychological assessment of a situation is influenced by our experiences, upbringing, and culture. As a result, different people may have different emotional reactions to similar situations. The ability to produce and recognise emotional facial expressions, on the other hand, appears to be universal. However, cultures differ in terms of how frequently and under what circumstances it is "okay" to express various emotions, as well as how various emotional expressions are interpreted.

4.2.3 Biology of Emotions

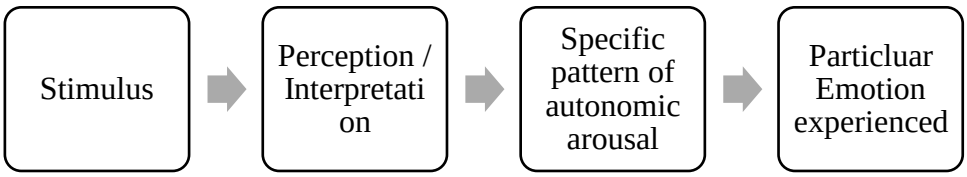
Emotions are the result of complex biological processes involving multiple bodily systems. The limbic system, which includes the amygdala and hippocampus, serves as the brain's emotional circuit. Both the amygdala and the hippocampus are involved in both normal emotional processing and mood and anxiety disorders. The autonomic nervous system (ANS) and the reticular activating system (RAS) also play important roles in emotional experience and processing.

4.2.4 Theories of Emotions

Over time, Several theories have been proposed by researchers to explain how human emotions arise and are represented in the brain. Among these are the James–Lange theory, the Cannon–Bard theory, the Schachter–Singer theory and the facial-feedback hypothesis.

- **James–Lange theory of Emotion-** Emotions, according to the James–Lange theory of emotion, arise from physiological arousal. According to the James–Lange theory of emotion, emotions arise from physiological arousal: in other words, the self-perception of changes in the body produces emotional experiences. According to this theory, when we laugh (a physiological response to a stimulus), we feel happy (an emotion); when we cry, we feel sad (an emotion). For example, if you came across a venomous snake in the garden, your sympathetic nervous system (which is in charge of activating your fight-or-flight response) would initiate physiological arousal, causing your heart to race and your breathing rate to increase. According to the James–Lange theory of emotion, you would only feel fear after this physiological arousal had occurred. Different arousal patterns would be associated with various emotions.

Figure 4.1 : The James–Lange theory of emotion



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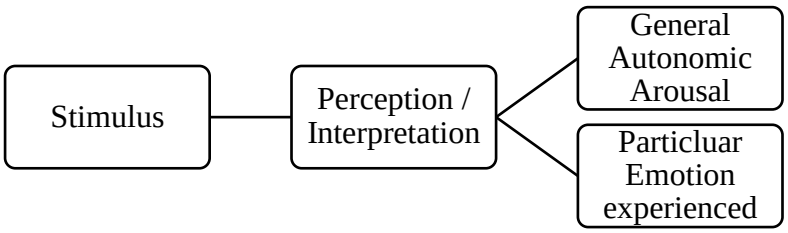
- **Cannon–Bard theory of Emotion -** According to the Cannon–Bard theory of emotion, physiological arousal and emotional experience occur concurrently but independently. Researchers who criticised the James–Lange theory for its inability to account for the wide range of emotions experienced by humans developed the Cannon–Bard theory of emotion. While the James–Lange theory contends that emotions emerge from physical arousal, the Cannon–Bard theory contends that physiological arousal and emotional experience occur concurrently but independent. According to this theory, when you see a venomous snake in the garden, you experience fear at the same time your body initiates its physiological fight-or-flight response. Even if they happen at the same time, your emotional and physiological reactions will be distinct and independent.

  According to the Cannon–Bard theory, emotional expression is caused by activation of the brain's subcortical centres. The optic thalamus, in particular, is a region that houses the neural structures for various emotional expressions. The sensory organs of an individual receive an emotional stimulus, and information about that stimulus is then relayed to the cerebral cortex. Such information is associated with conditioned processes in the cortex, which determine the direction of the response and stimulate the thalamic processes.

Figure 4.2 : The Cannon–Bard theory



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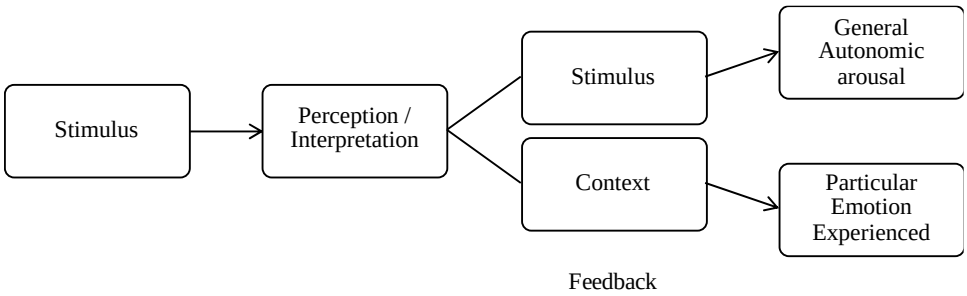
- **Schachter–Singer theory of Emotion -** Emotion, according to the Schachter–Singer theory, is the result of the interaction of two factors: physiological arousal and cognition. The Schachter–Singer theory of emotion (also known as the two-factor theory) attempts to explain emotion as it relates to physiological arousal, similar to the James–Lange and Cannon–Bard theories. Emotion, according to the Schacter–Singer theory, arises from the interaction of two factors: physiological arousal and cognition. This theory, in particular, contends that physiological arousal is cognitively interpreted within the context of each situation, resulting in the emotional experience. These cognitive interpretations — how a person labels and understands what they are experiencing — are formed as a result of the person's previous experiences.

  For example, if you see a venomous snake in the garden, according to this theory, the snake will elicit sympathetic nervous system activation (physiological arousal) that will be cognitively labelled as fear (cognition) based on the context. The sensation you would actually have is one of fear.

Figure 4.3 : Schachter–Singer theory of Emotion



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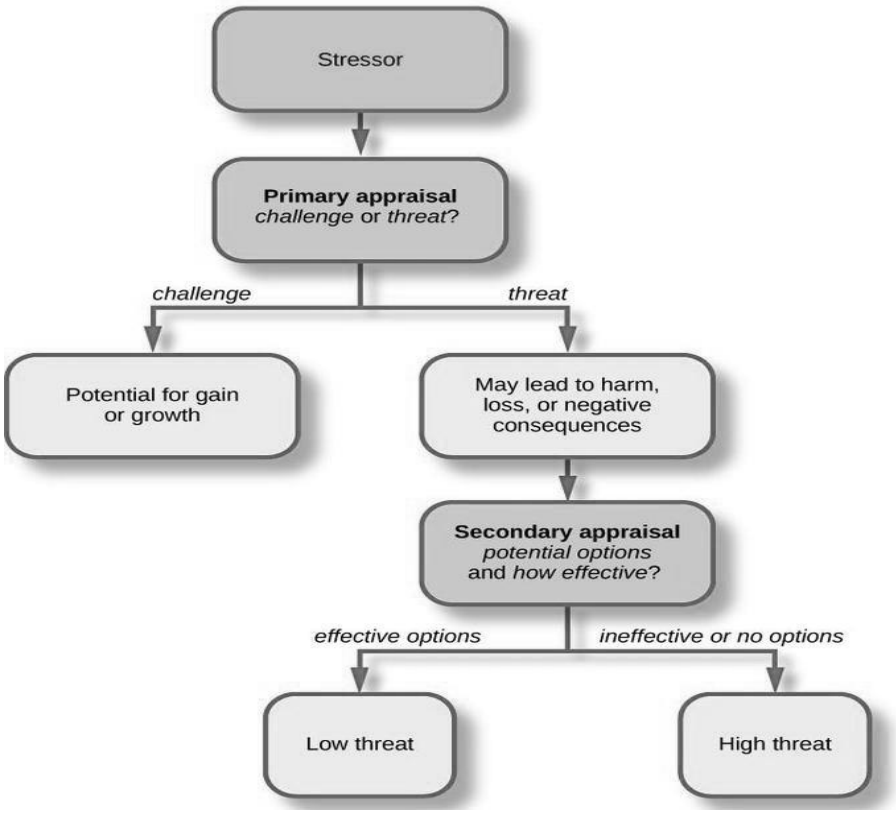
- **Lazarus's cognitive-mediational theory –** Psychologist Richard Lazarus (1991) slightly adapted Arnold's work in the development of his cognitive-mediational theory, which asserts that our emotions are determined by our assessments of stimuli. This appraisal, which is

immediate and often unconscious, acts as a bridge between the stimulus and the emotional response. In contrast to the Schachter–Singer theory of emotions, which sees emotion as the result of an interaction between physiological arousal and cognition, Lazarus argued that appraisal comes before cognitive labelling, stimulating both physiological arousal and the emotional experience itself.

According to Lazarus, the cognitive activity involved in interpreting emotional context can be conscious or unconscious, and it can take the form of conceptual processing or not. He emphasised that cognitive processes control the quality and intensity of emotions by mediating the relationship between the person and the environment through coping strategies, which in turn form the basis of the emotional reaction. Lazarus identified two major types of appraisal methods in his research: 1) primary appraisal, which seeks to establish the significance or meaning of an event, and 2) secondary appraisal, which assesses the individual's ability to cope with the event's consequences. Lazarus defined primary appraisals in the context of emotion and stress as judgments about the degree of potential harm or threat to well-being that a stressor might introduce. The perception of a threat then prompts the secondary appraisal—a judgement of the options available to cope with the stressor, as well as perceptions of how effective those options will be.

Figure 4.4 : Lazarus's *cognitive-mediational theory*



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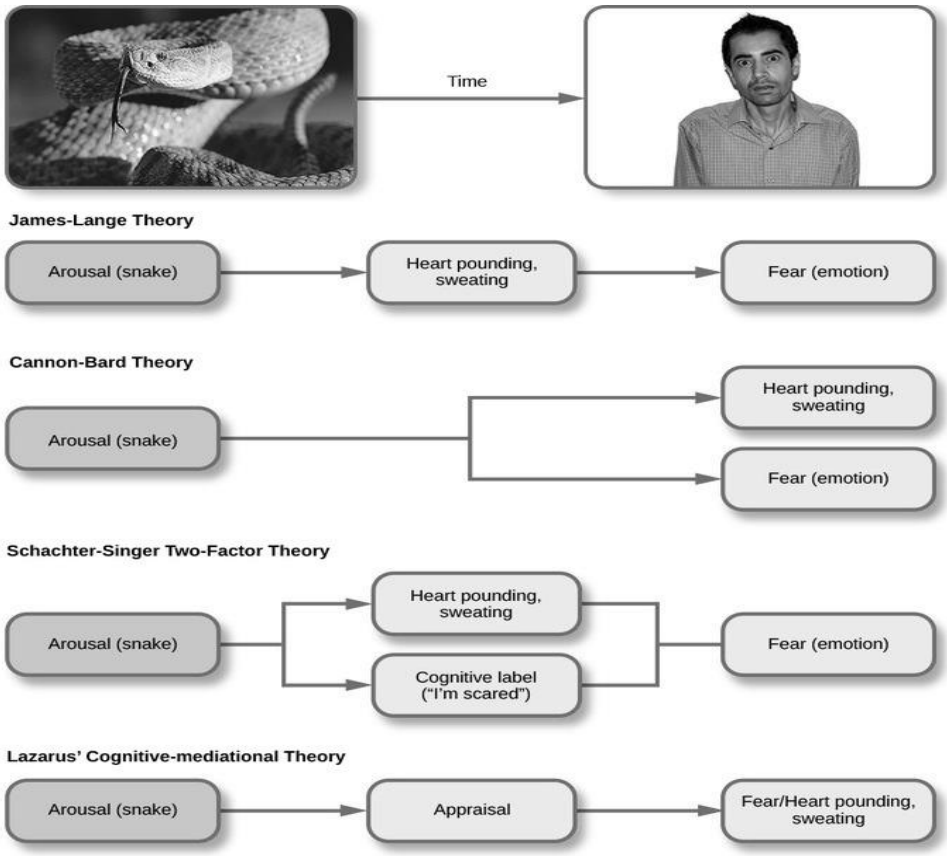
- **The facial-feedback hypothesis –** According to the facial feedback hypothesis, our emotions can be influenced by our facial expressions. Is it true that smiling makes you happy, or that being happy makes you smile? According to the facial feedback hypothesis, facial expressions are not only the result of our emotions, but they can also influence our emotions. To put it another way, the act of smiling can make you feel happier (Buck,1980; Soussignan,2002; Strack, Martin, and Stepper, 1988).

  According to research into the facial feedback hypothesis, suppressing emotional facial expressions may reduce the intensity with which those emotions are experienced (Davis, Senghas, & Ochsner, 2009). Of course, emotion can be expressed not only through facial expressions but also through tone of voice and behaviour. Body language, in particular, is the expression of emotion through body position and movement. According to research, even if we are not consciously aware of it, we are quite sensitive to the emotional information communicated through body language (de Gelder, 2006; Tamietto et al., 2009).

Figure 4.5 : Comparing of the Theories of Emotions



Note:- This figure illustrates how Lazarus' appraisal theory differentiates from the James–Lange, Cannon–Bard and Schachter–Singer theories of emotion.

Source: From "Theories of Emotion" by Lumen – Boundless Psychology. https://courses.lumenlearning.com/boundless-psychology/chapter/theories-of-emotion/ .Copywrite by Lumen Learning.

4.2.5 Interpreting Emotions

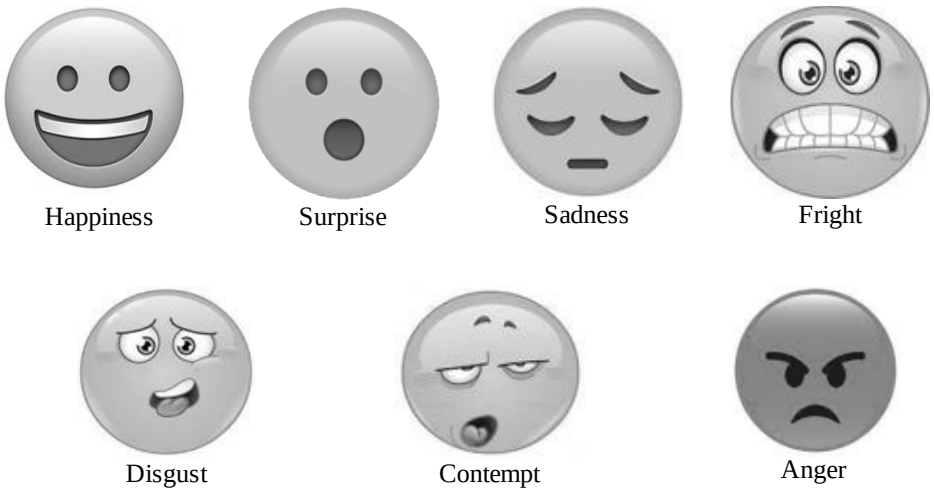
In everyday life, environmental cues influence our understanding of what facial expressions mean. Similarly, when people are attempting to interpret facial expressions, cultural context serves as a cue. People can only pay attention to a small number of available cues in their complex and constantly changing environments, and growing evidence suggests that people from different cultural backgrounds allocate their attention very differently. As a result, people from different cultures may interpret the same social context in vastly different ways.

4.2.6 Are Emotions Universal?

Although cultural conventions for displaying emotion differ, our ability to recognise and produce associated facial expressions appears to be universal. The theory that there are seven universal emotions, each associated with a distinct facial expression, has been supported by research comparing facial expressions across cultures. Because these emotions are "universal," they function independently of culture and language. Happiness, surprise, sadness, fright, disgust, contempt, and anger are the seven emotions (Ekman & Keltner, 1997). Even congenitally blind people (people born blind) produce the same facial expressions associated with these emotions, despite never having seen them in other people. This lends support to the theory that the patterns in facial muscle activity are universal for these specific emotions' facial expressions.

It is worth noting that more complex emotions, such as jealousy, love, and pride, differ from these more basic emotions in that they involve awareness of one's own and other people's relationships. As a result, complex emotions are more likely to be influenced by cultural differences than the seven more basic emotions.

Figure 4.6 : Universal facial expressions



Source: From "Theories of Emotion" by Lumen – Boundless Psychology. https://courses.lumenlearning.com/boundless-psychology/chapter/theories-of-emotion/ .Copywrite by Lumen Learning.

4.2.7 Emotional self - regulation

An emerging literature has begun to document the affective consequences of emotion regulation. Little is known, however, about whether emotion regulation also has cognitive consequences. Emotion regulation refers to the evocation of thoughts or behaviours that influence which emotions people have when people have them and how people experience emotions or express these emotions. Because emotions may be regulated in almost limitless ways, we have found it helpful to adopt a consensual model of emotion to provide an overarching framework for studying emotion regulation (Gross, 1998b, 1999). In this model, emotion regulatory efforts may be directed at a 2 different points in the emotion generative process: Antecedent - focused emotion regulation is worked at the front end, or very early on the emotion generative process, whereas response-focused emotional regulation occurs at the back end, or after emotion response tendencies have been triggered.

- In the context of a potentially stressful situation, **antecedent focused emotion regulation** might take the form of construing a potentially emotional situation in a way that decreases its emotional relevance, a process that has been called *reappraisal* (Gross, 1998). In other words, because reappraisal is antecedent to a potentially upsetting event, if effective, it actually pre-empts full blown emotional responses.

- By contrast, **response-focused emotion regulation** is evoked after the event has already been appraised in emotional terms and thus has triggered emotional response tendencies. Frequently, this kind of emotional regulation takes the form of inhibiting the urge to act on emotional impulses that continually press for expression. This process which we term *expressive suppression*, has affective consequences that differ from reappraisal.

Emotion regulation allows one to look and feel better during emotional circumstances without discernible cognitive costs. Emotion theorists have long emphasised that emotional regulation is widespread among adults in Western cultures and some theorists have gone so far as to argue that it is rare to see adult emotion that is not regulated (Tomkins, 1962). A quite different possibility suggested by Baumeister et al (1998) is the ego depletion model which holds that any sort of self-regulation depletes mental resources. The theory is that willpower is connected to a limited reserve of mental energy, and once we run out of that energy, we're more likely to lose self-control. Attentional models of self-regulation suggest that efforts to maintain or change behavior evoke a negative feedback loop whereby an existing condition of the system is compared with some salient standard. The automaticity view suggests that emotion regulation is overlearned and is thus cognitively inexpensive. On the other hand, ego depletion and attentional views suggest emotion regulation is consumptive of finite self-regulatory energy or attentional resources.

According to Richards and Gross (1998, 2000), expressive suppression should reduce memory for emotional events but that reappraisal should not. There were three studies that tested this hypothesis. Study 1 experimentally manipulated expressive suppression during film viewing, showing that suppression led to poorer memory for details of the film. Study 2 manipulated expressive suppression and reappraisal during slide viewing along with the levels of emotion (high eliciting and low eliciting) and verbal or non-verbal memory. Only suppression led to poorer slide memory. Study 3 examined expressive suppression and reappraisal. The findings of study 2 showed that participants who suppressed ongoing - emotion -expressive behaviour showed poorer memory for verbally encoded information and in fact, reappraisal enhanced nonverbal memory. One explanation for this is that assuming the perspective of a medical professional activates a 'doctor script' that directs attention to medically relevant aspects of the slides showing injuries.

Suppression impaired verbally encoded memory without affecting emotion experience (Study 1 and 2) or active attentional withdrawal (study 2). Moreover, memory for impairment was evident for both the low emotion and high-emotion conditions. The mechanisms by which expression suppression might affect memory are –

- Active avoidance, or looking away from the emotion- eliciting slide.
- self-focus which might decrease attention to extend events while increasing attention to internally generated stimuli such as sensation.

Subvocalization, engendered by an internal self-regulatory dialogue. Subvocal self- monitoring plays an important role in accounting for the effects of suppression on memory. Expressive suppression led to poorer verbal memory performance and had no impact on

non-verbal memory performance.

In order to study the effects of emotion regulation on verbal and non-verbal memory we conducted the following experiment.

4.3 PROBLEM OF THE STUDY

To study the effects of emotion regulation on verbal as well as non-verbal memory.

4.4 HYPOTHESIS

1. The mean recognition score of the emotion expression group will be higher than the mean recognition score of the emotion suppression group for verbal recognition test of memory.
2. The mean recognition score of the emotion expression group will be higher than the mean recognition score of the emotion suppression group for non- verbal recognition test of memory.

3. There was no significant difference in the difficulty level of the verbal and non-verbal recognition test.

4.5 DESIGN

Random group design with two levels of independent variable.

Group
Expression Group
Suppression Group

4.6 OPERATIONAL DEFINITIONS OF VARIABLES

4.6.1 Independent Variable:-

Emotion regulation manipulated at 2 levels - emotion expression and emotion suppression.

4.6.2 Dependent Variable

1. Mean recognition score of the verbal test of memory.
2. Mean recognition score of the non-verbal test of memory.

4.6.3 Control Variables:

1. All 5's were shown the same article and the same picture.
2. The distractor task was held constant at 2 minutes for all Ss.
3. The verbal recognition task consisted of 15 target words and 10 distractor words which were randomly arranged.
4. The recognition test was counter - balanced such that half the S's did the verbal task first, the other half did the non-verbal task first.
5. The non-verbal recognition test was counterbalanced such that the correct picture was placed in either the third or fourth position.
6. The time limit for the verbal recognition test was 2 minutes.
7. The time limit for the non-verbal recognition test was 2 minutes.
8. All the Ss were fluent in written or verbal English
9. Two 5-point Likert scales were administered for the S's in order to obtain the difficulty of both tests.

4.7 METHOD

4.7.1. Sample

Individual Data:

Name of the Test Taker (Subject / Participant Name)	Age	Gender	Class	Emotional State

Group Data:

Minimum Total of 32 = 16 per group (expression group and suppression group) (based on the number of students in class, equally divide the class into two equal groups – expression group and suppression group).

4.7.2 Apparatus and Materials:

1. A sheet of paper with the picture and article
2. A sheet of paper with 24 words, 14 target words and 10 distractor words.
3. A sheet of paper with 6 pictures, 1 target picture and other 5 were the distractor pictures.
4. Stop watch
5. Stationery
6. 2 Likert scales- for verbal as well as non-verbal test
7. Screen

4.7.3 Procedure:

The class was divided into two equal groups. One half received the expressive condition whereas the other half received the suppressive condition. Some did the verbal recognition test before the non-verbal recognition test whereas the others did the non-verbal recognition test before the verbal recognition test. On the non-verbal recognition test some received SET I where the right answer was C and some received SET II where the right answer was Counterbalancing and randomization was done in order to control the effect of practice or fatigue. Order for the instructions are based on the condition the Experimenter received.

The E arranged the materials and called the S in the lab. The S was made to sit at a distance from which he/ she could respond. Rapport was built and the following instructions were given.

For Expression Group

"This is a simple experiment. I'll give you a sheet of paper with a picture and a corresponding article which you have to read. The article you will be reading might be a little unpleasant. If you experience any discomfort whilst reading the article, please feel free to express yourself in any way you like. For e.g., through your facial expression, or talking about it, or any other way you like. Please remember to pay attention to the picture and article shown to you . Have you understood? Shall we begin?

For suppression group

“This is a simple experiment. I'll give you a piece of paper with you a picture and a corresponding article which you have to read. The article you will be reading might be a little unpleasant. It is extremely important for the sake of the study that if you; have any feelings as you lead please try your best not to show i.e. Don't show the articles your feelings as you read the article, please try your best not to let your feelings show. i.e. Don’t show any facial expression or express yourself verbally or show your feelings through your body language. In other words, as you read the article, please try to behave in such a way that a person watching you wouldn't know that you are feeling anything at all. This is extremely important because you are going to be observed and rated on your ability to conceal your emotions. Please remember to pay complete attention to the picture and article shown to you. Have you understood? Shall we begin? “

Non-verbal Recognition Task (For both expression and suppression group)

“I'll give you a sheet of paper with six pictures on it. One of these pictures is the original picture shown to you in the article.. Please look at all these pictures carefully and choose the picture that you think is the original picture. You will be given 2 minutes for this task.

Verbal Recognition (For both expression and suppression group)

“Now I'll give you a sheet of paper with a number of words on it. Some of these words were present in the article you read before. Your task is to tick off as many words as you remember being present in the article shown to you. You’ll be given 2 minutes for this task.”

Likert Scale (For both expression and suppression group)

“I’ll give you two rating scales – one for each task/ You have to rate the difficulty level of each task on one of the each scales.

4.7.4 Post task Questions:-

- How did you find the experiment?
- Do you have any questions or comments about this experiment ?

(more questions could be added based on the discussion in class with the teacher.)

4.7.5 Debriefing :-

In a "debriefing", experimenter explains the purpose of the study, explains the use of deception (if any was used), encourages the participant to ask questions about the study, and allows the experimenter to address any harm to the participant that may have resulted from their participation in the study. Here, students will prepare a debrief under the guidance of the teacher.

4.8 RESULTS AND DISCUSSION

Emotion regulation is the elicitation of thoughts and behaviours that influence which emotions people have, when they have them, and how they experience or express these emotions. The goal of this experiment was to look at the effects of emotion regulation on both verbal and nonverbal memory.

The class was divided into two groups- one half got expression condition and the other half got suppression condition. Some did verbal task before the non-verbal recognition task while others got non-verbal before verbal recognition task. On the non-verbal recognition test, some got SET I where the right answer was C and some got SET II where the correct answer was D. These counterbalancing and randomization was done in order to control the effect of practice or fatigue.

This section would describe individual results and group results. Firstly, explain the results of individual data. Use the table given below (Table 4.1) to make a note of the correct responses given by the participant (Subject) on the verbal recognition test. Also, make a note of the response given on the non-verbal test of recognition. If the right answer was given, give it a 1 and if the wrong answer 0. On the Likert scale, note down the difficulty level as indicated by the participant. In recognition tasks, since guessing is likely, Final recognition Score would be calculated to find out the true recognition levels of the S (Table 4. 2). Unique observations (ease of the task, doubts or questions raised during debriefing, etc…) made during the experiment can be noted down here.

Table 4.1:- Individual data for the Expression / Suppression Group

Verbal Recognition	Non-Verbal Recognition	Likert Scale (Rating)	
		Verbal	Non-Verbal

Table 4.2:- Individual Data to calculate Final Recognition Score.

		RESPONSES	
		YES (If S ticks the words)	NO (If S doesn't tick the word)
STIMULUS	TARGET (Words shown) 14	**HIT** ☐	**MISS** ☐
	DISTRACTOR (words not shown) 10	**FALSE ALARM** ☐	**CORRECT REJECTION** ☐

Final Recognition Score

$$\frac{\text{No. of words correctly recognized}}{\text{No. of original words} + 2\,(\text{No. of Wrongly recognized words} + \text{No. of Omitted Words}}$$

For the group data, all the individual results from these two groups would be collected and placed in the table given below – Table 4.3 would mention data of the Scores of Expression/ Suppression group for verbal , non-verbal and Likert scale.

Since this experiment was a random group design with two levels of IV, Chi Square was calculated here. Firstly, Chi values for verbal recognition task would be calculated. Explain the result obtained along with the mean and state if it was in line with hypothesis 1 or no. Secondly, Chi values for non-verbal recognition task would be calculated. Explain the result obtained along with the mean and state the hypothesis 2 would be accepted or rejected.

A t test would be conducted for the Likert scale to find the significance value. This would be done to indicate whether the Ss found the non-verbal recognition test more difficult than the verbal recognition test (hypothesis 3). Support all the results with past research findings.

Table 4.3: Group Data – Scores of Expression / Suppression group for verbal , non-verbal and Likert scale.

Ss	Group (Expression / Suppression)	Verbal Test (No of correctly recognized words)	Non Verbal (1 if right and 0 if wrong)	Likert (Verbal)	Likert (Non-verbal)
1	Expressive Non Verbal				
2	Expressive Verbal				
3	Expressive Verbal				
4	Expressive Non Verbal				
5	Expressive Verbal				
6	Expressive Non Verbal				
7	Expressive Verbal				
8	Expressive Non Verbal				
9	Expressive Non Verbal				
10	Expressive Verbal				
11	Expressive Non Verbal				
12	Expressive Non Verbal				
13	Expressive Verbal				
14	Expressive Non Verbal				
15	Expressive Verbal				
16	Expressive Verbal				
So on……					
	TOTAL				
	MEAN				
	S.D.				

Ss	Group (Expression / Suppression)	Verbal Test (No of correctly recognized words)	Non Verbal (1 if right and 0 if wrong)	Likert (Verbal)	Likert (Non-verbal)
1	Suppressive Non Verbal				
2	Suppressive Verbal				
3	Suppressive Verbal				
4	Suppressive Non Verbal				
5	Suppressive Verbal				
6	Suppressive Non Verbal				
7	Suppressive Verbal				
8	Suppressive Non Verbal				
9	Suppressive Non Verbal				
10	Suppressive Verbal				
11	Suppressive Non Verbal				
12	Suppressive Non Verbal				
13	Suppressive Verbal				
14	Suppressive Non Verbal				
15	Suppressive Verbal				
16	Suppressive Verbal				
So on……					
	TOTAL				
	MEAN				
	S.D.				

4.9 CONCLUSION

The conclusion should summarize the key themes / arguments of the experiment. Your conclusions summarize how your results support or contradict the hypothesis. Suggest the key takeaways from this experiment.

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5

EXPERIMENT ON DECISION MAKING

Unit Structure :

5.0 OBJECTIVES

At the end of this unit, learner should be able to –

- Learn about the concepts of decision making, heuristics and cognitive biases.
- Understand of the phases in decision making.

- Recognize and explain the various Cognitive illusions in Decision making
- Identify the I.V, D.V and CVs in an experiment
- Describe the different Experimental designs with one IV and two IVs
- Frame hypothesis for experiments.

5.1 TITLE

A study of heuristic biases in decision making under the conditions of uncertainty.

5.2 INTRODUCTION

This unit covers the topic of Decision Making and Heuristics.

5.2.1. Decision Making

Decision Making can be regarded as an outcome of mental processes leading to the selection of a course of action among several alternatives. From a psychological perspective, it is necessary to examine individual decisions in the context of set of needs, preferences an individual has and values they seek. From a cognitive perspective, the decision making process must be regarded as a continuous process integrated in the interaction with the environment. Therefore, decision making is a reasoning or emotional process which can be rational or irrational, can be based on explicit assumptions or tacit assumptions. Psychology defines decision-making as the cognitive process that leads to the choice of a belief or a course of action from a variety of potential alternative options. The process of making decisions is a form of reasoning that is predicated on the decision-values, maker's preferences, and beliefs (Simon,1960). Every choice-making process results in a final decision, which may or may not lead to action.

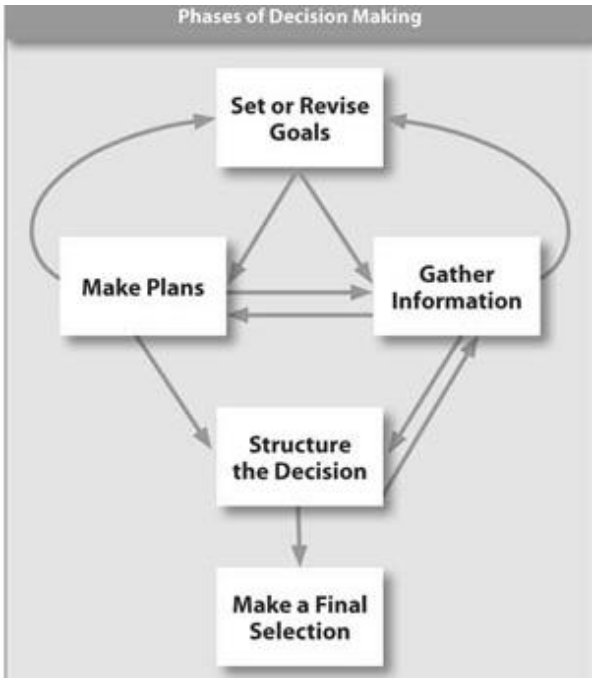
Herbert Simon (1957), suggested that we humans are not necessarily irrational, but rather that we show bounded rationality – we are rational but within limits. In 1970s, Tversky built on Simon's notion of bounded rationality and observed that we sometimes use a differential strategy when faced with far more alternatives than we feel that we reasonably can consider in the time we have available.

5.2.2. Phases of Decision Making

Decision-making can be categorised into five different groups (Galotti, 2002). A schematic representation of these categories is shown in Figure 5.1. These tasks frequently take place in a specific order, but there may be "cycles" to an order, as shown by the arrows in the figure, in which specific tasks are revisited and redone. These phases imply that there might or might not be a predetermined order for the tasks, that one task's performance might overlap with that of another, that some tasks might be skipped, and that tasks might be completed in a different order.

a) Setting Goals – When we try to understand why someone makes one choice over another, it frequently turns out that the reasons for the decision have to do with the decision maker's goals (Bandura, 2001). When establishing goals, the decision-maker is supposed to reflect on his or her future plans, principles and values, and top priorities. In other words, the decision-maker must come up with responses to the question, "What am I trying to achieve?" These are the decision maker's objectives, and they will have a variety of effects on the decision-making process (Galotti, (2002).

Figure 5.1 : Phases of Decision Making



Source : Galotti (2002, p. 97).

b) Gathering Information – Before deciding, the decision-maker needs information. She or he in particular needs to be aware of the choices available. Along with learning about options, decision-makers might also need or want to learn about potential standards they could use to narrow down their options (Galotti, (2002).

c) Structuring the Decision – Decision-makers require a method of compiling all of their data for complex decisions. This is particularly true when there are a lot of options and various factors that need to be taken into account. The decision-maker must find or create a method for managing the information. The process by which she or he accomplishes this is referred to as decision structuring (Galotti, (2002).

d) Making a Final Choice – The decision-maker must choose from the final set of options after gathering all the data. Other decisions may need to be made during this process, such as when to end the

information-gathering stage of the main decision or which information is more reliable or relevant (Galotti, (2002).

e) **Evaluating -** Evaluation of the entire process is a helpful (and likely frequently skipped) final step in decision-making. What went well about the process? What could have gone better? What didn't go as planned? Here, the goal is to reflect on the process and pinpoint the elements that need improvement as well as those that should be applied once more when making decisions of a similar nature in the future (Galotti, (2002).

5.2.1. Heuristics

Tversky and Kahneman changed the face of judgement and decision making research by suggesting that people may be far more likely to make decisions based on biases and heuristics. Heuristics are used to reduce mental efforts in decision making. Humans make decisions by employing heuristics, which are mental shortcuts. They are simple strategies used by humans, animals, organisations and even machines (Marsh, 2002; Gigerenzer & Brighton, 2009; Hutchinson & Gigerenzer, 2005; Gigerenzer & Gaissmaier, 2011; Braun et.al., 1999) to quickly form judgments, make decisions, and solve complex problems. Often, this entails focusing on the most important aspects of a problem or situation in order to develop a solution. (Alan, 2018; Lori, 2007; Nevid, 2008; Gigerenzer & Brighton, 2009). Heuristic processes are used to identify the solutions and answers that are most likely to be successful or accurate, but they are not always the best or most accurate options (Goldstein, 2018). In circumstances of uncertainty and with incomplete information, judgments and decisions based on heuristics are simply adequate to meet an immediate need (Scholz, 1983). They can therefore be different from the conclusions drawn from logic and probability.

5.2.2. Cognitive illusions in Decision making

Research on people's decision-making abilities and styles has consistently revealed the existence of certain systematic and common biases, or ways of thinking that lead to systematic errors. Under most circumstances, the biases are understandable and often justifiable ways of thinking, but when misapplied, they can lead to errors. These systematic biases have been termed cognitive illusions (von Winterfeldt & Edwards, 1986b). The term itself is intended to invoke the analogy of perceptual illusions: cognitive errors that occur for understandable reasons and provide information relevant to understanding normal functioning. We can and do call these illusions "errors," in the sense that one's perception differs from reality. However, these illusions are not used to demonstrate that the entire perceptual system is flawed and untrustworthy. Rather, illusions (perceptions under specific conditions) teach us about how the perceptual system works in general—what cues are attended to, how they are interpreted, and so on.

Similarly, errors in decision making reveal something about how people gather, sort, and integrate information before making a decision. In general,

the most fundamental heuristics is the “trial and error” which can be used in everything. Heuristic may lighten the cognitive load of making decisions but may lead to systematic biases or errors in judgement. Tversky and Kahneman proposed three heuristics in their initial research: availability, representativeness and anchoring and adjustment.

- **Representativeness** - People judge the probability or frequency of a hypothesis by considering how much the hypothesis resembles available data as opposed to using Bayesian calculation. It is evident when people categorise things, such as when determining whether or not a person is a criminal. While often very useful in everyday life, it I can also result in neglect of relevant base rates and other cognitive biases. Another related judgement is the gambler’s fallacy, in which the gambler mistakenly believes that the probability of a given random event is influenced by previous random events.

- **Availability heuristic** - We make judgements on the bases of how easily we can call to mind what we perceive as relevant instances of a phenomenon. Most of us at least occasionally use the availability heuristic. People tend to correlate events that occur close together. When people estimate the likelihood or frequency of an event based on its availability, they are employing the availability heuristic (Tversky & Kahneman, 1973).

- **Anchoring and adjustment heuristic** -A common heuristic used when people estimate a number is anchoring and adjustment (Baron, 2000). Starting with a readily available number—the "anchor"—and shifting either up or down to arrive at an answer that seems plausible is how Tversky and Kahneman originally described it (Baron, 2000). In the experiments conducted by Tversky and Kahneman, participants did not move sufficiently away from the anchor. So even though the anchor is obviously irrelevant, it taints the estimate. However, people rely too heavily on the anchor, and their adjustments are too small.

Many more have been discovered as a result of subsequent research. “Judgment heuristics” are heuristics that underpin judgement. Another type, known as “evaluation heuristics”, is used to assess the desirability of various options (Hastie &Dawes, 2009). The following cognitive illusions provide information about when unaided human decision making is likely to be optimal and when it is not. Finally, these descriptions can assist us in designing and implementing educational programmes or interventions to improve the quality of people's decisions and plans.

- **Framing effect -** Kahneman and Tversky defines decision framing as the “decision maker's conception of the act, outcomes and contingencies associated with a particular choice”. Framing effect demonstrates that the way in which a question is worded (framed) and the background context of the choice itself can influence the outcome the decision. According to cognitive bias, people choose options based on whether they are presented with positive or negative connotations, such as a gain or a loss (Plous, 1993). When a positive

frame is presented, people tend to avoid risk, but when a negative frame is presented, people tend to seek out risks (Tversky & Kahneman, 1981). The scenario defines gain and loss as descriptions of results (e.g., lives lost or saved, disease patients treated and not treated, etc.).

- **Illusory correlation -** Another judgement phenomenon is illusory correlation in which we tend to see particular events or particular attributes and categories as going together because we are predisposed to do so. A false association may be formed because rare or novel occurrences are more noticeable and thus attract one's attention.

- **Over-confidence -** Another common error is over-confidence (an individual's over evaluation of his / her own skills, knowledge or judgement. One instance of incorrectly calibrating subjective probabilities is overconfidence. Overconfidence has been defined in the research literature in three different ways: (1) overestimating one's actual performance; (2) over placing one's performance relative to others; and (3) over precision in expressing unwarranted certainty in the accuracy of one's beliefs (Moore & Healy,2008; Moore & Schatz, 2017).

- **Sunk cost fallacy -** An error in judgement that is quite common is sunk cost fallacy, which is the decision to continue to invest in something simply because one has invested in it before and one hopes to recover one's investment. By doing so, we frequently ignore information that suggests we made the wrong choice, such as illness or unfavourable weather that affected the event.

- **Opportunity costs -** In making judgements, it is also important to take into account opportunity costs, which are the price paid for availing oneself of certain opportunities. Most people weigh the pros and cons when making important decisions, but they are less likely to take opportunity cost into account, which is an important factor. That refers to what else you could do with the time or money.

- **Hindsight bias -** Finally, a bias that often affects all us is hindsight bias. Specifically, once we look at a situation retrospectively, we easily can see all the signs and events leading up to a particular outcome. Hindsight bias enables people to persuade themselves after an event that they correctly predicted it before it occurred. People may draw the conclusion that they can predict other events with accuracy as a result.

- **Confirmation Bias –** The tendency to search only for information that will confirm one's initial hunch or hypothesis and overlook or ignore any other information. According to Nickerson (1998), the tendency to seek out, interpret, favour, and remember information that supports or confirms one's pre-existing beliefs or values is known as confirmation bias (Nickerson, 1998). People exhibit this bias when they choose facts that support their opinions while ignoring those that

contradict them or when they interpret ambiguous facts as supporting their pre-existing beliefs. Desired outcomes, emotionally charged issues, and strongly held beliefs all have a stronger impact. Although confirmation bias cannot be completely eliminated, it can be controlled, for instance, by critical thinking education and training.

5.2.3. Prospect theory

Prospect theory was developed by Kahneman and Tversky in 1979 as a psychologically realistic alternative to expected utility theory. Prospect theory is a theory that describes decision between alternatives that involve risk i.e. alternatives with uncertain outcomes, where the probabilities are known. The model is descriptive; it tries to model real-life choices, rather than optimal decisions. It allows one to describe how people make choices in situations where they have to decide between alternatives that involve risk, e.g. in financial decisions. Starting from empirical evidence the theory describes how individuals evaluate potential losses and gains. In the original formulation the term prospect referred to lottery.

Prospect theory proposes that an individual's behaviour can be explained by the fact that, given a set of independent, singular choices, a reasonable assumption could be made that the probability of either a gain or a loss is 50/50 rather than the actual probability. In essence, people think that the probability of a gain is higher. Given two options that both lead to the same outcome, an individual will choose the one that offers perceived gains because, according to Tversky and Kahneman, losses have a greater emotional impact on a person than equivalent gains (Tversky & Kahneman, 1992).

In order to find out whether people use heuristics while making decisions, the following experiment was conducted.

5.3 PROBLEM OF THE STUDY

To study heuristic biases in decision making under the conditions of uncertainty.

5.4 HYPOTHESIS

1. When the representativeness is manipulated, the representativeness heuristics in decision making would be used than logical reasoning.

2. When the availability is manipulated, the availability heuristics in decision making would be used than logical reaching

3. The availability score will not correlate with intelligence.

4. The representativeness score will not correlate with intelligence.

5.5 DESIGN

Repeated measures design with one independent variable having 2 levels. Each subject was exposed to both the levels.

5.6 OPERATIONAL DEFINITIONS OF VARIABLES

5.6.1 Independent Variable:-

Manipulation of – availability and representativeness heuristic.

5.6.2 Dependent Variable:-

Responses made by the S by using heuristic

5.6.3 Controls:

1. Problem 1 and 2 are examples of availability whereas the other are representativeness.
2. There was no time limit for heuristics but a limit for I.Q. test (12 mins).

5.7 METHOD

5.7.1 Sample

Individual Data:

Name of the Test Taker (Subject / Participant Name)	**Age**	**Gender**	**Class**

Group Data:

Minimum Total of 20

5.7.2 Apparatus and Materials:

1. Sheet with problems out of which the first two availability and remaining 7 were representativeness heuristic.
2. Cultural Fair Scale manual with answer sheet.
3. Temperament scale with 60 items and a 5 point rating - scale.
4. Stationery
5. Screen
6. Stopwatch

5.7.3 Procedure:

The E set the table, arranged the material and called the S in the laboratory. The S was made to sit at a distance from which she could respond. Rapport was built and the following instructions were given: "This is a simple experiment. I shall present you various problems on a sheet of paper. Think about them carefully and solve them. Solve them as quickly as possible".

The S was then given an I.Q. test for which the instructions were given in the manual. The S was given 3 mins for Test Ist, 4 mins for IInd Test, 3 mins for Test IIIst and 2 mins mins for I.Q.Test.

Later, the S was given a Temperament test which had 60 items with a 5 point rating scale. There was no time limit for this.

5.7.4 Post task Questions:-

- How did you find the experiment?
- Do you have any questions or comments about this experiment?

(more questions could be added based on the discussion in class with the teacher.)

5.7.5 Debriefing :-

In a "debriefing", experimenter explains the purpose of the study, explains the use of deception (if any was used), encourages the participant to ask questions about the study, and allows the experimenter to address any harm to the participant that may have resulted from their participation in the study. Here, students will prepare a debrief under the guidance of the teacher.

5.8 RESULTS AND DISCUSSION

The Heuristics are rules of thumbs or shortcuts used to reduce mental efforts in decision making. The experiment was a repeated measures design where the S was exposed to all the levels of IV. The dependent variable was the responses made by the S.

This section would describe individual results and group results. Firstly, explain the results of individual data. Make a note of the responses given by the participant (Subject). Unique observations (ease of the task, doubts or questions raised during debriefing, etc…) made during the experiment can be noted down here. Since this experiment was a repeated measures design with one independent variable having 2 levels, each subject was exposed to both the levels. Individual data checked whether the S used heuristic for the problems and which kind of heuristic – availability or representative was commonly used. Also, IQ result was generated from the IQ test that was given.

For the group data, all the individual results from 20 students in class (randomly selected) would be collected and placed in the table given below – Table 5.1.

Table 5.1 :- Group data

Sr. No	SS Age	SS Sex	Letter Position 1 or 3					Letter Estimate as ration to 1					2i	2ii	2ii	4	6	Intelligence
			R	L	K	V	N	R	L	K	V	N		a	b			
1																		
2																		
3																		
4																		
--																		
--																		
20																		

Since this experiment was a repeated group design with one independent variable having 2 levels, For descriptive statistics median was calculated for the letter estimate as a ration to 1, 2iia and 2iib. A sign test was calculated for the letter position, problem 2i, problem 4 and problem 6. A correlation was calculated between problem 4 and intelligence and between problem 6 and intelligence using point biserial.

Once the tests are conducted based on the finding, it would have to be mentioned if the results supported the hypothesis or rejected. Support these results with past research findings.

5.9 CONCLUSION

The conclusion should summarize the key themes / arguments of the experiment. Your conclusions summarize how your results support or contradict the hypothesis. Suggest the key takeaways from this experiment.

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6

EXPERIMENT ON PROBLEM SOLVING

Unit Structure :

6.0 OBJECTIVES

At the end of this unit, learner should be able to –

- Understand the concepts of problem solving and creative thinking.
- Identify ways of solving problem.
- Assess Insight and Non-sight problems
- Identify the I.V, D.V and CVs in an experiment

- Describe the different Experimental designs with one IV and two IVs
- Frame hypothesis for experiments.

6.1 TITLE

Effect of interruption and the nature of interruption on the solving of insightful problem process.

6.2 INTRODUCTION

6.2.1. Problem Solving

A problem can be defined as a situation in which a person is trying to reach some goal and must find means for arriving at it (Chi & Glaser, 1985). Problem Solving can be defined as the cognitive processes used in transforming a given state of information into a goal state using specific means of solution. It is the process of developing solutions to remove an impediment to achieving an ultimate goal. Problem solving begins with the recognition that a problem exists. The solver must observe a difference between the current state of affairs and some derived state of affairs. The desired state becomes the goal & the solver undertakes mental processes to achieve those goals. A problem space is a mental representation of a problem that contains original state, goal state of a problem as well as intermediate state that must be searched in order to link beginning and the end of the task. In contrast to complex problems, which have multiple problems that must all be resolved at once, simple problems only have one problem (Frensch & Funke, 2014).

6.2.2. Classes of problems

The ability to clearly define and identify a problem is the first and most important requirement for solving any problem. There are two types of problems: well-defined problems and ill-defined problems. Reitman (1964), who classified problems based on information on three components, namely, start state, goal state, and transformation function, is credited with the invention of the well-structured and ill-structured distinction.

Ill-defined and well-defined problem each requires a different approach. Well-defined problems have specific end goals and clearly expected solutions, whereas ill-defined problems do not. Compared to ill-defined problems, well-defined problems allow for more initial planning (Schacter et. al., 2009). Problem-solving sometimes involves dealing with pragmatics, or how context affects meaning, and semantics, or how the problem is perceived. The secret to solving a problem is having an understanding of what the objective of the problem is and what rules might be used. Sometimes the issue calls for creative problem-solving or abstract thought.

For several reasons, psychologists have concentrated on clearly defined problems: they are simple to present, don't require weeks or months to solve, are simple to score, and are simple to alter. Although the assumption has not been thoroughly tested, it is believed that problem solving for ill-defined

problems operates similarly to problem solving for well-defined problems (Galotti, 1989). According to a study by Schraw, Dunkle, and Bendixen (1995), performance on well - defined problems did not correlate with performance on ill-defined ones.

6.2.3. Creative thinking

Creative thinking is aimed at producing something novel and desirable. Great artists, poets, musicians. scientists and inventors are engaged in creative thinking. Creativity is a mental and social process involving the discovery of ideas or concepts. According to Gestalt philosophers like Wertheimer (1945), assert that the process of creative thinking is integrated line of thought that does not lend itself to the segmentations implied by the steps of a model. One of the earliest models of creative process is attributed to Graham Wallas. Wallas (1926) proposed that creative thinking proceeds through four phases:-

1. Preparation- definition of issue, observation and study
2. Incubation – Laying the issue aside for some time.
3. Illumination- the moment when a new idea finally emerges.
4. Verification- checking it out.

6.2.4. Ways of solving problem

The ways to solve a problem depends, to a great extent on the problem. There are different ways of solving problem such as:-

a) Trial and error - In trial and error solutions, the organisms solves the problem by trying out various alternatives till he hits upon the correct one. This is the lowest level of problem solving. Almost all organisms learn new behaviours using this fundamental method of learning. Trial and error involves trying a method, seeing if it works, and trying a different method if the first one doesn't.

b) Means-End Analysis - It involves comparing the goal with the starting point, thinking of possible ways of overcoming the difference and choosing the best one. The selected option may have certain prerequisite condition. If they aren't met, then sub goal is created. Through the creation of sub goals, the task is broken down into manageable steps that allow a full solution to be constructed. In short, it involves figuring out the figuring out the “ends” you want and then figuring out the “means” you will use to reach theses ends. Means end analysis is a more focused method of solution than generate and test. It guides the problem solver more in choosing what step to take next. it also forces the problem solver to analyse aspects of the problem before starting to work on it and generate a plan to solve it. Means end analysis is not always the optimal way to reach a solution.

c) Generate and test hypothesis- It consists of generating possible solutions and then testing them. It is useful when there are no much possibilities to keep track of. Generate and test technique loses its

effectiveness very rapidly when there are many possibilities and when there is no particular guidance over the generation process.

d) Backtracking- In solving a problem, you need to make certain assumptions. Sometimes they turn to be wrong and need to be unmade. In such instances, it is useful of having some means of keeping a track of when and which assumptions are made, so you can backup to certain points of choice and start over.

e) Working Backward - User analyses the goal to determine the last step needed to achieve it, then the next to last step, and so on. It involves establishing sub goals and so functions similarly to means end analysis. It is most effective when backward path is unique, which makes the process more efficient than working forward.

f) Reasoning by Analog - Analogies pervade human thinking. We use a solution to an earlier problem to help with a new.

6.2.5. Insight and Non-sight problems

There are two kinds of problems: Insight and Non-sight problems. A non-insight problem is solved gradually, step by step, using reasoning skills and a set of procedures and rules. e.g. a math problem. In contrast, when solvers attempt insight problem, initially it might seem impossible, but then an alternate explanation enters the mind. The impasse - insight sequence was first observed by gestalt psychologists (Duncker, 1945; Kohler, 1921 and Wertheimer, 1959). Solving insight problems may not require different processes from solving non-insight problems (Weisberg & Alba, 1981). Insight problem is an extension of other types of problem solving.

Schooler, Ohlsson & Brooks (1993) conducted experiments which examined whether verbalization can interfere with insight problem solving. In the experiment, the Ss were interrupted during problem solving and asked either to verbalize their strategies (retrospective verbalization) or engage in an unrelated activity (control). Ss in retrospective verbalization condition were significantly less successful than control subjects at solving the problem. Their findings are consistent with the hypotheses that verbalisation can result in the disruption of nonreportable processes that are critical to achieving insight solutions.

A recent study by Wilson and Schooler (1991) provided further evidence that verbalization can increase the salience of the verbalizable attributes of a stimulus and thereby overshadow the non-verbalizable attributes. Wilson and Schooler examined the effects of verbalizing affective judgments, which is another domain for which subjects are unable to articulate their thought process (Nisbett and Wilson, 1977).

In order to study the effect of interruption and the nature of interruption on the solving of insightful problems process, the following experiment was conducted.

6.3 PROBLEM OF THE STUDY

To study the effect of interruption and the nature of interruption on the solving of insightful problem process.

6.4 HYPOTHESIS

Presence of verbalization whether relevant or irrelevant to the task will have no effect on insight problem. Solving in terms of the members of correct responses.

6.5 DESIGN

Random group design with one IV having 3 levels.

6.6 OPERATIONAL DEFINITIONS OF VARIABLES

6.6.1 Independent Variable:-

No interruption, Relevant verbalization and irrelevant verbalization.

6.6.2 Dependent Variable:-

The number of correct responses obtained by S.

6.6.3 Controls:

1. The CS was given no interruption task.
2. The ES was either given related verbalization or unrelated verbalization (interruption).
3. The interruption was given after 90 secs for the ES.
4. The ES was given 2 mins to finish verbalisation after interruption.
5. The total time given for problem solving was 10 mins for both ES and CS.
6. The Ss were correctly timed.
7. Noise and Distraction to be kept at minimum.

6.7 METHOD

6.7.1 Sample

Individual Data:

Group	Name of the Test Taker (Subject / Participant Name)	Age	Gender	Class
CS				
ES				

Group Data:

N = 20

6.7.2 Apparatus and Materials:

1. 4 different insight problems on 4 sheet of papers were given to both CS and ES.
2. 4 blank sheet of paper for rough work for both CS and ES.
3. Stopwatch
4. Stationery
5. Screen

6.7.3 Procedure:

The class was divided into two equal groups. One half received the experimental condition whereas the other half received the controlled condition. Based on the condition the Experimenter received, instructions for the Subject were given.

The E arranged the materials and called the S in the lab. The S was made to sit at a distance from which she could respond. Rapport was built and the following instructions were given.

Instructions for Es.

"This is a simple experiment on problem solving. I will give you some sheets of paper with different problems on it. Your task is to solve them." The E gave the problems to the S and asked to solve it. After 1 $^1/_2$ min (90 secs), the E interrupted and asked to verbalize either relevant or irrelevant material for 2 mins. After that, the ES could continue with the problem. After 10 mins, the E took back the problems whether the Ss finished or didn't finish solving the problems.

Instructions for Cs.

"This is a simple experiment on problem solving. I will give you some sheets of paper with different problems on it. Your task is to solve them." The E gave the problems to the S and asked to solve it. For the CS, there was no interruption in the problem solving task. After 10 mins, the E took back the problems whether the Ss finished or didn't finish solving the problems.

6.7.4 Post task Questions:-

- How did you find the experiment?
- Do you have any questions or comments about this experiment ?

(more questions could be added based on the discussion in class with the teacher.)

6.7.5 Debriefing :-

In a "debriefing", experimenter explains the purpose of the study, explains the use of deception (if any was used), encourages the participant to ask questions about the study, and allows the experimenter to address any harm to the participant that may have resulted from their participation in the study. Here, students will prepare a debrief under the guidance of the teacher.

6.8 RESULTS AND DISCUSSION

When solving an insight problem, it might initially seem impossible, but eventually a different explanation comes to mind. The goal of this experiment is to investigate how interruptions of various kinds affect the ability to think critically and solve problems. The class was split into two groups; one group, designated as CS, received no interruptions, while the other group, designated as ES, was given either the related verbalization (interruption) or non-related verbalization (interruption) task.

Both individual results and group results are described in this section. Firstly, explain the results of individual data. Make a note of the correct responses that the participant (Subject) provided regarding the quantity of problems that the CS or ES solved, the amount of time it took to solve those problems, the level of difficulty or ease experienced during problem solving, etc. in the table below (Table 6.1). Unique observations (ease of the task, doubts or questions raised during debriefing, etc…) made during the experiment can be noted down here.

Table 6.1 :- Individual data

Problem No	CS solved Problem	ES solved Problem
1		
2		
3		
4		
Total		

For the group data, all the individual results from these two groups would be collected from the students in class (randomly selected) and placed in the table given below – Table 6.2 would mention data of the Scores of ES and CS group. In order to find out the impact of interruption a chi square would have to be calculated.

Table 6.2 :- Group data

	No Interruption	Relevant	Irrelevant	Total
Fo				
Fe				
n				

Once the tests are conducted based on the finding, it would have to be mentioned if the results supported the hypothesis or rejected. Support these results with past research findings.

6.9 CONCLUSION

The conclusion should summarize the key themes / arguments of the experiment. Your conclusions summarize how your results support or contradict the hypothesis. Suggest the key takeaways from this experiment.

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