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An Experimental Study on the Effects of Primacy and Recency on Recall among Secondary School Students

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Abstract

The serial-position effect refers to the tendency of individuals to recall the first and last items in a sequence more accurately than those presented in the middle. This phenomenon comprises two components: the primacy effect, in which early items are remembered better, and the recency effect, in which the most recently presented items are recalled most effectively. The concept was first introduced by Hermann Ebbinghaus, whose self-experiments demonstrated that recall accuracy varies according to an item's position within a list. In free recall tasks, individuals typically begin recalling items from the end of the list, reflecting the recency effect, while the initial items are also recalled more frequently than the middle items, indicating the primacy effect. The purpose of the present study was to examine the effect of serial position on memory recall. An experimental method was employed, and the sample consisted of 20 adults without cognitive impairment. The memory task involved a word list containing 40 items. For analysis, the items were divided into three conditions based on their serial position: primacy (items 1–10), middle (items 11–30), and recency (items 31–40). The data were analysed using statistical techniques to compare recall performance across the three conditions. The results revealed a statistically significant difference in memory retention among the primacy, middle, and recency positions ($F = 6.79$), confirming the presence of the serial-position effect. The findings indicate that recall performance is significantly influenced by the position of information within a sequence, with superior recall for items presented at the beginning and end of the list.

Keywords: *Primacy Effect, Recency Effect, Serial-Position Effect, Recall, Memory.*

1. Introduction

One of the most commonly used procedures to study memory is the free recall procedure. In a typical free recall task, the experimenter presents a list of words at a rate of one word for every 3 seconds. The subjects is to

recall items in any order. The results show that the level of recall was highest for the words that had been presented at the beginning and end of the list **(Glanger and Cumitz, 1966)**. This outcome is called the serial position effect because the retention of an item depended upon the position effect in which it had been presented.Serial learning is one of the methods of verbal learning. Memorization through serial method was first experimented by Ebbinghaus 1902). Better recall of the words at the beginning of the list contributes to the serial position effect and is known as the Primacy effect. Items encountered/exposed first are remembered relatively well. The better recall of the words at the end of the list is known as the Recency effect.

2. Primacy effect:

The primacy effect, in psychology and sociology, is a cognitive bias that results in a subject recalling primary information presented better than information presented later on. Many investigations believe that the primacy effect reflects the output of the long term store, whereas the recency effect reflects the output of the short term store. The subjects rehearse the initial items frequently thereby transferring the items to the long term store and this long term store accounts for the primacy effect. The primacy effect is reduced when items are presented quickly and is enhanced when presented slowly (factors that reduce and enhance processing of each item and thus permanent storage). Longer presentation lists have been found to reduce the primacy effect. In 2013, a study showed that primacy effect is also prominent in decision making based on experience in a repeated-choice paradigm, a learning process also known as operant conditioning. The authors showed that importance attached to the value of the first reward on subsequent behavior, a phenomenon they denoted as outcome primacy.

3. Recency effect:

The subjects retain the last few words in the short term store. This accounts for recency effect. The recency effect is reduced when an interfering task is given. Intervening tasks involve working memory, as the distractor activity, if exceeding 15 to 30 seconds in duration, can cancel out the recency effect. Additionally, if recall comes immediately after the test, the recency effect is consistent regardless of the length of the studied list, or presentation rate. The items in the middle of the list are recalled poorly for at least two reasons. First, they are so far from the end of the list that they are not in the short term store at the beginning of the retention test. Second, the subjects did not rehearse them extensively because only a few items can be rehearsed at a time.

There are also factors that can impact the strength and likelihood of the recency effect occurring. Factors that can influence the occurrence of the recency effect include:

- **Task Factors:** This refers to the task itself as well as how the information is processed. The length of the information presented and how it is presented can influence the recency effect. If you were presented a very short list of words, for instance, you might find it easy to recall all the items, essentially eliminating the recency effect. A very long list of terms, on the other hand, would be much more likely to produce recency effects.
- **Processing:** How you attend to and process the information as it is presented can also affect how it is recalled.
- **Time:** If a long period of time lapses between the presentation and rehearsal of the information and recall, the recency effect is dramatically reduced or even eliminated altogether.
- **Intervening Tasks:** Interference can occur if another task or information is presented after the first task. Research has found that if the distracting task takes longer than 15 to 30 seconds, it will eliminate recency effects when trying to recall the original information.

4. Impact on Learning

As you might imagine, the recency effect can play an important role in the learning process. When you are learning new information, you are most likely to remember the things that you study first (the primacy effect) as well as those things you study last (the recency effect). This means that when tested on the material, you are more likely to forget the things that were learned in the middle. However, there are things that you can do to adapt your study sessions to take advantage of these memory phenomena. As you structure your study

time, realize that the period at the beginning and the period at the end are your prime learning times.

5. Try the following steps:

- Focus on the most important information at the beginning to take advantage of the primacy effect. This might involve reviewing important terminology or learning new information.
- Use the middle of your learning time to read through old material you have already learned. This period is essentially downtime, but it can be useful for reviewing.
- Spend the last part of your study session reviewing what you have already learned. This can involve rehearsing those important terms or going over your newly learned material.

Doing this will help cement newly learned information into your memory and minimize the chances or forgetting the things you learned in the middle of your study session.

Teachers can also take advantage of the recency effect in how they structure classroom time. The first part of the class should focus on important information. This means skipping over things like basic administrative tasks such as taking attendance and meet-and-greet icebreakers.

The middle section of class might involve a brief break where these formalities might be better attended to. Finally, those last 10 to 20 minutes of the class should focus on circling back to the most important concepts.

6. Review of Literature

Chung Won Lee1,JinHoKim1, and In KeukHwang (2019) were conducted a study on "A Study on the Serial Position Effect of Memory according to Illumination of LED Light" to verify the forms of the effect of serial position effects of memory according to the illuminance of light. Results of this study showed that the difference between primacy and middle items was statistically significant in relatively dim conditions. These results show that the primacy effect is strong in the dim condition, and the retrieval is low in the middle item. The recency effect was also good in the dim condition, but it was low in the relatively bright condition.

DevanshiDesai (2016) was conducted a study on "The significance of mode of presentation on the serial position effect: an exploratory study". This experiment aimed to look at the significance of mode of presentation (auditory, visual printed and visual pictures) on serial position effects. Participants in this experiment were tested with different treatment conditions. With the auditory group, participants were asked to recall the words by writing them down after the experimenter read out the list of 21 common-concrete nouns at the rate of 1 second per word. With the visual printed and visual pictures group, the participants were asked to recall the words by writing them down after the experimenter presented the stimuli on a PowerPoint presentation. The results indicated that there was a significant main effect of serial position. However, a significant main effect of mode of presentation and the interaction between the mode of presentation and serial position wasn't found.

7. Research Methodology

Research Problem: An Experimental Study on the Effects of Primacy and Recency on Recall among Secondary School Students

Objectives of the Study

8. General Objective

- To experimentally examine the effects of primacy and recency on recall ability among secondary school students.

8.1 Specific Objectives

- To determine the level of recall for items presented at the beginning (primacy position) of a learning list.
- To determine the level of recall for items presented at the end (recency position) of a learning list.
- To compare the recall performance of students for primacy items and recency items.
- To examine the difference in recall performance between primacy, middle, and recency positions in a serial learning task.
- To study the effect of time interval (immediate vs delayed recall) on primacy and recency effects.
- To analyse differences in recall based on gender (if included as a variable).

- To draw educational implications of primacy and recency effects for classroom teaching and learning strategies.

9. Hypotheses of the Study

9.1 Null Hypotheses (H_0)

- There is no significant difference in recall between items presented at the primacy position and those presented at the recency position among secondary school students.
- There is no significant difference in recall among primacy, middle, and recency items in a serial learning task.
- There is no significant effect of primacy on recall among secondary school students.
- There is no significant effect of recency on recall among secondary school students.
- There is no significant difference in recall performance between immediate recall and delayed recall conditions.
- There is no significant difference in the primacy and recency effects on recall based on gender. *(if gender is included)*

9.2 Alternative Hypotheses (H_1)

- There is a significant difference in recall between items presented at the primacy position and those presented at the recency position.
- There is a significant difference in recall among primacy, middle, and recency items.
- Primacy has a significant effect on recall among secondary school students.
- Recency has a significant effect on recall among secondary school students.
- There is a significant difference between immediate and delayed recall with respect to primacy and recency effects.

10. Sample of the Study

This experiment was performed in adults 20 people with no cognitive impairment. The participants were 7 males and 13 females, and the mean age was 24.2 years. In addition, prior to the experiment, participants were fully informed about the experiment.

- A list of 40 words divided into 3 categories: the first 10 corresponding to the primacy effect, the middle 20 words and the last 10 corresponding to recency effect.
- (Wooden screen-used in the lab method)

A list of 40 words was prepared using MS Power point. The participant is seated comfortably in front of the computer screen. The instructions on the screen are read out clearly and after checking if they understood the slides were presented.

1) Care was taken to ensure the list was not exposed to the subject prior to the experiment.
2) The subject should be able to view only one word at a time.

11. Results and Findings

The analysis was performed by dividing the word items into three conditions: primacy, middle, and recency. Primacy used the first 10items in the word list, Middle used the 11th item to 30th item in the middle of the word list, and finally Recency used the last 10 items in the word list for analysis. Recalled words of all candidates were tabulated under these three conditions and done descriptive statistics like mean and standard deviation and inferential statistics i.e. One way ANOVA.

Table I: Participants data for number of words and percentage of recall for primacy, recency and also for middle words.

..	**Primacy Words recalled (1st 10 words**	**Middle Words Recalled (Middle 20 words)**	**Recency words recalled(Last 10 words)**
Number of Words recalled by all participants	113	184	73
Percentage of Recall (%)	56%	46%	36%

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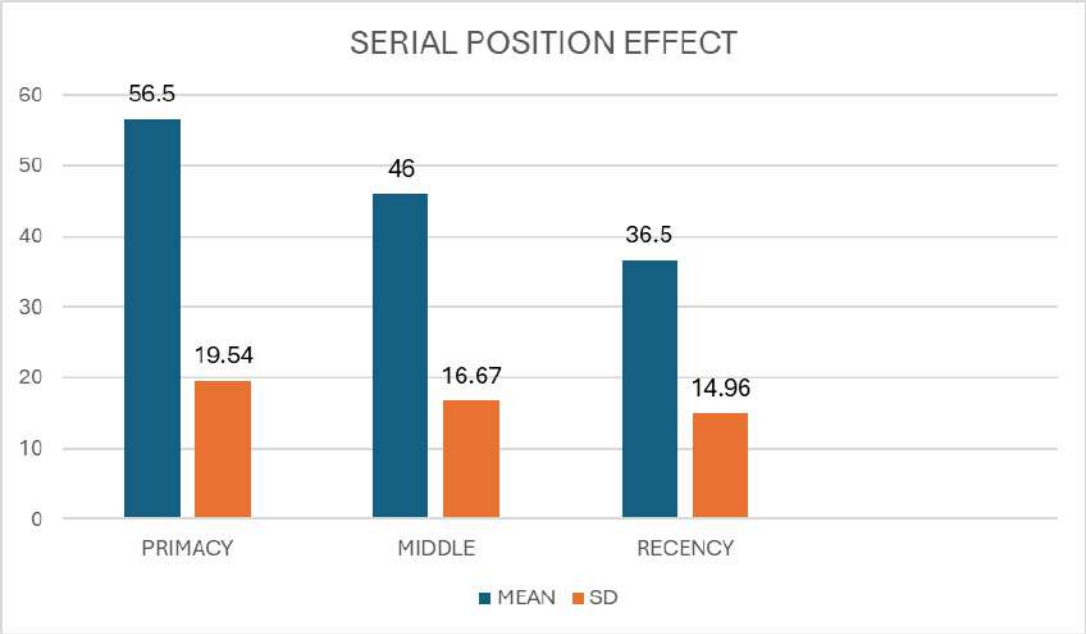
Table II: Showing the Mean, Standard deviation and 'f' value of recall for primacy, recency effects and also for middle words.

Recall	Primacy Words recalled (1st 10 words	Middle Words recalled (Middle 20 words)	Recency words recalled(Last 10 words)	F ratio
Mean	56.5	46	36.5	6.79
S.D	19.54	16.67	14.96	

Graph – 1: Bar diagram showing the Mean, Standard deviation of recall for primacy, recency effects and also for middle words.



12. Discussion

Table -I shows that the percentage recall for first 10 words (primacy) is 56%, for last 10 words is 36%. Thus it shows that primacy effect has been noted. The percentage of recall for middle 20 words is 46% .Thus it clearly shows that though there is a primacy effect at the individual level, there is a comparatively less recency effect. And the Table -II shows that the Mean scores of the primacy, middle and recency words are 56.5,46 and 36.5respectively and Standard Deviationscores of the primacy, middle and recency words are 19.54, 16.67 and 14.96 respectively. And result of ANOVA was F = 6.79, and showed that there was a statistically significant difference in memory retention of primacy, middle, and recency.

13. Implications

This phenomenon of primacy and recency helps us in acquiring learning strategies and in enhancing our memory.

Below are clear, practical, and classroom-oriented Educational Implications, written in research-standard language, directly derived from your experimental study on Primacy and Recency effects. These points are suitable for Chapter V (Findings & Implications) and for teacher training, NEP-2020 orientation, and pedagogy.

14. Educational Implications of the Study

Effective Lesson Planning

Teachers should place key concepts, definitions, and objectives at the beginning of the lesson (primacy effect) and important summaries, conclusions, and take-home messages at the end (recency effect) to maximize student recall.

- **Structuring Classroom Instruction:** Long lessons should be divided into shorter segments. Each segment should have a clear beginning and ending so that students benefit repeatedly from primacy and recency effects during instruction.
- **Improving Memory Retention:** Teachers should avoid overloading students with information in the middle of lessons, as recall is typically weakest in this phase. Active learning strategies such as questioning, discussion, and short activities should be introduced in the middle to maintain attention and retention.
- **Designing Effective Assessments:** Examination questions should be framed in a balanced manner by distributing important questions throughout the paper rather than clustering them in the middle. Teachers can also revise critical points at the end of lessons before assessments.
- **Use of Revision and Recapitulation:** Regular recapitulation at the end of each lesson strengthens the recency effect. Teachers should summarise major points using charts, keywords, or concept maps to enhance recall.
- **Teaching Strategies and Methods:** Instructional methods such as advance organizers, previews, and learning objectives at the beginning of the lesson enhance primacy. Similarly, exit slips, summaries, and reflection questions at the end support recency.
- **Implications for Digital and Online Learning:** In online or blended learning environments, instructional videos and digital lessons should begin with clear learning goals and end with summaries or quizzes to reinforce primacy and recency effects.
- **Curriculum Development:** Curriculum designers should structure textbooks and learning materials so that key ideas appear at the beginning and end of units and chapters, improving long-term retention among students.
- **Teacher Training and Professional Development:** Teacher education programmes should train teachers to apply memory principles like primacy and recency effects while planning lessons, assessments, and learning activities.
- **Support for Diverse Learners:** Understanding serial position effects helps teachers provide remedial teaching and memory-based strategies for slow learners and students with learning difficulties.
- **Alignment with NEP 2020:** The study supports NEP-2020's emphasis on cognitive science–based pedagogy, experiential learning, and competency-based education, encouraging teachers to adopt evidence-based instructional practices.
- **Enhancing Student Study Habits:** Students can be trained to plan their self-study sessions by placing difficult or important topics at the beginning and end of study periods, improving recall and academic performance.

15. Conclusion

The findings of the study highlight that memory is not uniform across learning sequences. By consciously applying primacy and recency effects, teachers can significantly enhance students' recall, comprehension, and academic achievement, thereby improving the overall effectiveness of secondary school teaching–learning processes.

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