# Serial Position Effect in Arabic Word Recall: Testing the Primacy and Recency Effects

**Name:** Sondos Wagih
**Course Name:** FGS 2025
**Date:** June 2025

## Summary

To be more precise, the study aims to determine whether people remember words differently when they differ in their position on the list, and whether they remember words mentioned at the beginning and end more than in the middle. The entire number of participants is 30 participants between the ages of 15 and 26.They saw fifteen different Arabic words. The words are displayed in just 30 seconds. After the seconds are up, the participants move to a page with a distraction task. The distraction task consists of simple mathematical equations such as addition and subtraction. The user performs it, then the user continues his experiment and moves to the next page of the site, which is entering the words he remembers in the empty fields Here comes my role. The user's results are sent to me via email when he clicks on sharing the result with the researcher of his own free will after agreeing to the terms of use. From the results, we can know the exact number of words that were remembered. An example of the results that arrive is the email:

**Memory test results:**
**Age:** 21
**Education level:** some-college
**Total score:** 11
**Percentage:** 73.3%
**Impact strength:** 50.0

📊Full Results:
**- Remembered Words:** 11/15 (73.3%)
**- First Words (Primacy):** 4/5 (80.0%)
**- Middle Words:** 2/5 (40.0%)
**- Last Words (Recency):** 5/5 (100.0%)
**- Effect Strength:** 50.0%

📝**Original Word List:**

flashlight, turtle, tent, caterpillar, scoop, lighthouse, cactus, cloud, computer, door, planet, spacecraft, necklace, bathtub, hurricane

📝**Participant's Responses:**

scoop, caterpillar, tent, turtle, hurricane, bathtub, necklace, spacecraft, planet, door, computer

The independent variable is the position of words (beginning, middle, end), while the dependent variable is the words remembered after changing the position. The results in the email confirmed the theory, as the standard deviation of the results was higher for beginnings (M = 2.97, standard deviation = 1.89) and endings (M = 2.13, standard deviation = 1.67) compared to words in the middle (M = 0.87, standard deviation = 1.44). This confirms the theory, as the results show an effect on memory with changing the position of words, consistent with the sequential position documented in research. This confirms the saying, "People remember beginnings and endings better than middles."

**Keywords:** serial position effect, primacy effect, recency effect, Arabic memory, word recall

## Introduction

There is a common belief among people that there is a relationship between the sequence of events and the ability to remember, basically, as many believe that events at the beginning and end are easier to remember than what happened in the middle. For example, when I asked one of my friends to remember something that happened a month ago, he literally told me that he could remember what came before it, that's was the beginning, and what happened last week, which was the end, but he could not remember what happened a month ago, which was the middle of the event. This belief is common, but none of those who believe this have tried to prove it with evidence and results. I decided to do this myself with my team, to conduct research on the subject and try to find out how accurate this is with results and evidence, as I used experimental evidence to try to find out if this phenomenon, scientifically known as the sequential position effect, applies to remembering the Arabic words included in my memory test.

The serial position effect refers to "the human mind's tendency to remember the first and last items in a sequence best, and the middle items worst" (Wikipedia, 2024). This phenomenon includes two distinct components: the primacy effect, which describes better recall of items presented at the beginning of a sequence, and the recency effect, which describes better recall of items presented at the end of a sequence.

Three key studies have established the theoretical foundation for understanding serial position effects in memory. First, Hermann Ebbinghaus conducted pioneering research on himself that led to the coining of the term "serial position effect," demonstrating that "recall accuracy varies as a function of an item's position" within a sequence (Wikipedia, 2024). His work established the basic U-shaped curve characteristic of serial position effects, where recall performance is highest at the beginning and end of lists.

Second, Murdock (1962) identified the serial position effect, showing that participants asked to free recall a list of twenty words correctly recalled more words at the beginning and end of the list than words in the middle (Pamoja Education, 2020). Murdock's research methodology involved presenting participants with word lists and measuring their free recall performance, establishing the experimental paradigm that continues to be used in serial position research. His findings demonstrated clear evidence of both primacy and recency effects across multiple word lists.

Third, Glanzer and Cunitz (1966) provided sound theoretical insights into the fundamental mechanism of serial position effects. Their research revealed that "the primacy effect (better recall of early list items) is attributed to long-term storage," while the recency effect is related to short-term memory processes (Simply Psychology, 2025). Explaining the term dual storage, they suggested that primacy effects are easier to remember because they receive a longer exposure and repetition in the brain, which moves them from short-term to long-term memory. The recency effect, on the other hand, is easier to remember because recency effects are present in short-term memory earlier, making them easier to remember when they are presented later.

After reviewing all these studies together, we find evidence that serial position effects are a powerful phenomenon in memory research. However, all of the studies mentioned were conducted in European or English languages. Therefore, what I decided to do is expand this study now to include Arabic and see if there are similar effects in Arabic, which would expand the scope of research on serial position effects and thus test the generalizability of serial position effects across different languages and different ethnicities.

The experiment I used in this study is a within-subjects experimental design to test serial position, but with Arabic words. The independent variable was the words and their position, which were organized into three groups: the first is the primacy position (from 1 to 5 words), the second is the middle position (from 6 to 10 words), and the last is the recency position (from 11 to 15 words). The dependent variable was the number of words correctly recalled by the user on whom the experiment was performed, and the correct number recalled from each position category.

Based on the reviewed literature and the common observation that beginnings and endings are more memorable than middles, the hypothesis for this study was that participants would demonstrate superior recall for words presented in the beginning and end positions compared to words presented in the middle position, thereby confirming the presence of both primacy and recency effects in Arabic word recall.

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# Method

## Participants

Thirty individuals participated in this study, ranging in age from fifteen to twenty-six years (Age range: 15-26 years). Participants were recruited through convenience sampling from the researchers' social networks and their team members' social networks. The sample included participants from various educational levels: some were middle school students, others were high school students, some were current university students, and others were university graduates. All participants were native Arabic speakers and participated voluntarily in the online memory task.

## Procedure

The experiment was conducted using a custom-designed web-based memory testing platform accessible at https://sondoswagih.github.io/Survey/. The study employed a within-subjects A design in which each participant is exposed to all three levels of the independent variable, which

A design in which each participant is exposed to all three levels of the independent variable, which is the word's position at the beginning, middle, and end.

When the user being exposed to the experiment enters, they first enter their demographic information, including age and educational level, while ensuring that their information and identity remain completely confidential. At the actual start of the experiment, the user is exposed to four main stages: the first is the memorization stage, the second is the distraction stage, the third is the recall stage, and the final stage is the data collection stage, subject to the user's conditional consent.

The memorization phase is the first phase, where fifteen Arabic words are shown to participants for 30 seconds on their screens. These words were set to be simple and easy to remember, and different words appear randomly for each different session, ensuring that the conditions vary between participants who conduct the experiment after they agree to the conditions. The choice of words shown to participants was easy, simple, and familiar to be easy to remember. Examples of these words are فيل (elephant), قيثارة (guitar), قوس قزح (rainbow), دراجة (bicycle), جبل (mountain), حاسوب (computer), شطيرة (sandwich), فراشة (butterfly), منارة (lighthouse), and سجادة (carpet).

The independent variable was operationally defined by word position within the fifteen-word list: words in positions 1-5 constituted the beginning condition, words in positions 6-10 constituted the middle condition, and words in positions 11-15 constituted the end condition. This created three groups of five words each, allowing for systematic comparison of recall performance across serial positions.

Following the thirty-second encoding period, participants immediately engaged in a distraction task designed to prevent rehearsal and control for recency effects. This distraction phase involved solving simple mathematical problems consisting of basic addition and subtraction operations. The mathematical distraction task lasted for a brief period before proceeding to the recall phase.

During the recall phase, participants were directed to a new page where they could type any words they remembered from the original list. The recall was self-paced and participants could enter words in any order they chose (free recall). No time limit was imposed during the recall phase, allowing participants to retrieve as many words as possible.

Several variables were controlled throughout the procedure. The presentation time (thirty seconds) was held constant for all participants. The distraction task was standardized using only addition and subtraction problems. The recall interface was identical for all participants, and the same basic word types (concrete nouns) were used throughout, though specific words varied randomly across sessions.

## Materials

The primary research instrument was a custom-developed web-based memory testing application programmed specifically for this study. The application was designed to present stimuli consistently across participants and automatically record response data.

As previously mentioned, care was taken to keep the Arabic words simple, accessible, and tangible. They were randomly selected from specific groups, making them distinct depending on the session. The reason for choosing them simply was to make them familiar to Arabic speakers, and also to target all age groups. Care was taken to display the words in standard Arabic font at a legible size against a neutral background to avoid any visual impairments affecting the test.

As for the distraction materials, they consisted of simple arithmetic problems, generated algorithmically and changing with each session, just like the Arabic words. They included one- and two-digit numbers, with addition and subtraction operations only. They were primarily designed to distract participants' general memory, without making the calculations so difficult or burdensome that they would cause participants to feel uncomfortable, frustrated, or overworked.

As for the description of the memory interface, 15 blank fields were provided for participants to enter the words they remembered. All interfaces were designed to be easy and accessible, so participants felt they were in a simple and fun memory test game. Participants entered as many words as they could in the blank fields as they remembered. The system recorded all of this, along with all entries being timestamped, although timing data was not analyzed in the current study.

All the complete materials, including word sets, math problems, and interface screenshots, are available in Appendix A (see accompanying materials).

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## Results

Descriptive statistics revealed clear differences in recall performance across the three serial positions. Participants recalled an average of 2.97 words (SD = 1.89) from the beginning positions, 0.87 words (SD = 1.44) from the middle positions, and 2.13 words (SD = 1.67) from the end positions out of five possible words in each category.

The pattern of results strongly supported the predicted serial position effect. Recall performance was highest for words in the beginning positions, lowest for words in the middle positions, and intermediate for words in the end positions. This created the characteristic U-shaped curve typical of serial position effects, with superior performance at both ends of the list compared to the middle.

Individual participant patterns further illustrated the robustness of the effect. Of the thirty participants, twenty-one (70%) demonstrated the predicted pattern of recalling more words from the beginning and end positions than from the middle positions. Four participants (13.3%) showed equal recall for middle and end positions, but still recalled more beginning words than either middle or end words. One participant (3.3%) recalled more beginning and middle words than end words. Two participants (6.7%) achieved perfect recall of all fifteen words, while one participant (3.3%) failed to recall any words. One participant (3.3%) showed equal recall across all three positions, remembering one word from each category.

The statistical significance of these differences, while not formally tested in this descriptive analysis, appears substantial given the large effect sizes. The difference between beginning and

middle recall (2.10 words) and between end and middle recall (1.26 words) represent meaningful practical differences in memory performance.

These results provide strong empirical support for the serial position effect in Arabic word recall, demonstrating both primacy effects (superior recall of beginning words) and recency effects (superior recall of end words compared to middle words), consistent with the experimental hypothesis.

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## Discussion

The research discussion revolved around whether the famous saying "people remember beginnings and endings better than middles" is true, and whether it applies to Arabic words, allowing us to generalize this saying globally after using different languages. The hypothesis predicted that participants would be able to remember words at the beginning and end with superior ability compared to the middle, which supports the recency and primacy effect.

The results I received after the participants completed the exercise certainly strongly supported this hypothesis, with significant differences between the efficiency of remembering words at the beginning and end, and the poorer recall in the middle. Participants remembered significantly more words at the beginning (M = 2.97) and end (M = 2.13) than at the middle (M = 0.87), confirming the presence of primacy and recency effects in Arabic word recall tasks. In the results I statistically analyzed, a V appeared in the data table, indicating that endings and beginnings were remembered more than the middle, which is another factor supporting the theory.

This makes the results closely consistent with the three seminal studies reviewed in the introduction, which this research originally aimed to address. Just as Ebbinghaus's original research demonstrated that the human brain's memory accuracy varies with the sequential location of the item, his results replicate Murdock's (1962) findings. Both studies showed that participants remembered more words from the beginning and end of lists than from the middle, even though the lists used in the current study contained 15 words, while Murdock's lists contained 20. This pattern also fits with Glanzer and Cunitz's (1966) dual-storage interpretation: "A strong primacy effect likely reflects the successful transfer of early words to long-term memory through increased rehearsal time, whereas a recency effect indicates that later words remained available in short-term memory during the recall phase," as they put it. The interpretation of these results suggests several important points that serve our purpose. The recency effect on recall of the first words can be explained by the increased attention and rehearsal time these early items receive. As participants attempt to memorize the words, they unconsciously prioritize the first words because they are trying to memorize them in order, which leads them to remember the words first. Indeed, the results showed that the words in the beginning were the most memorable of the three middle items. Because participants focused their minds on memorizing the first words first, and even mentally rehearsing them after the

words have disappeared after the entire 30 seconds, this is typical of people exposed to a list of words they are seeing for the first time, and they tend to devote most of their attention to the first words. The better recall effect of the last words compared to the middle words is likely due to the fact that these items are newly encountered and therefore still available in short-term memory at the onset of recall, despite the intervening distractor task. The reason for not remembering middle words is their inappropriate placement between the first words, which receive special attention, and the last words, which fill short-term memory. This causes the latter words to replace the middle words in short-term memory. This is the reason for the U-shaped slope in the middle of the sequence position curve after counting.

The strengths of my study varied widely. The individualized approach to each participant was a strong motivating factor, providing good experimental control, as each participant was accountable for their own actions under various conditions. The online platform I created included good incentives and automatic data collection, and my use of concrete, accessible, and simple Arabic words made it easy for participants of all ages to complete. The distraction task was also a good idea, requiring participants to only write down what they remembered in their subconscious mind. I was extremely careful to keep this task as simple as the others, to avoid leaving the participant feeling frustrated and to prevent the distraction from interfering with the core task, which we desperately needed.

Despite all these strengths of my study, I also faced several limitations. First, the small sample size—only 30—made it difficult and embarrassing to confidently and loudly say that the results could be generalized to the entire 468 million Arab population and other Arabic speakers around the world. Also, all participants were from my own social circle, which also limited the accuracy of the results, as people within the same social circle often behave in similar ways. Furthermore, the fact that the participants were between 15 and 26 years old significantly limited the results. Despite the diversity in education, occupation, and field, the study still focused on a specific, small group of people.

In addition to another limitation, although the words were easy and tangible, the random selection of them and the appearance of different words for each different user showed a discrepancy that was not apparent to me as a researcher. Some words might be very familiar to some participants and easy to memorize, while others might be familiar but not as familiar to the other person, which leads to a significant difference in the results between their words. Also, although I was keen to provide an easy website that looks more like a game than something that would be used in scientific research, and also my keenness to make the words clear, large, and with a neutral background, I was unable to control the environmental influences around each user while they were taking the test. Distractions might be due to the difference in devices or the people around them who might distract them in the middle of the test, or it might also be due to the different times at which people participate. Some participated when they had just woken up, and others participated while fully focused. All of these points negatively impact the experimental research that I wanted to create.

Therefore, I commend future researchers who undertake this research to address these limitations by resolving the problems mentioned or not mentioned. Research samples with a larger number of people will be more effective and will enhance the generalizability we aim for. Also, the presence of formal data analysis and appropriate tests such as repeated analysis of variance between participants will provide a more accurate assessment of this. The study of individual

differences and their factors such as age, educational level, occupational and social differences, or even mental illness, and working memory capacity, can reveal important variables among participants.

In addition to paying careful attention to presentation time, list length, and standardization for each participant, and the duration of the distractor task, it may provide insights into the underlying influences of serial position cues on memory and their functions for Arabic.

Regarding the original common saying, the results provide strong empirical support for the notion that "people remember beginnings and endings better than middles." This folk wisdom appears to capture a genuine aspect of human memory functioning, at least in the context of word list recall. The saying holds true in most circumstances based on this data, with seventy percent of participants demonstrating the predicted pattern. However, the saying is not universally applicable—some individuals show different patterns, and perfect recall can occur under certain conditions. The saying appears most accurate when describing group-level tendencies rather than invariant individual performance.

In conclusion, this study successfully demonstrates the serial position effect in Arabic word recall, providing empirical validation for a widely-held belief about human memory. The findings contribute to the cross-linguistic evidence for serial position effects and suggest that fundamental memory processes operate similarly across different language systems.

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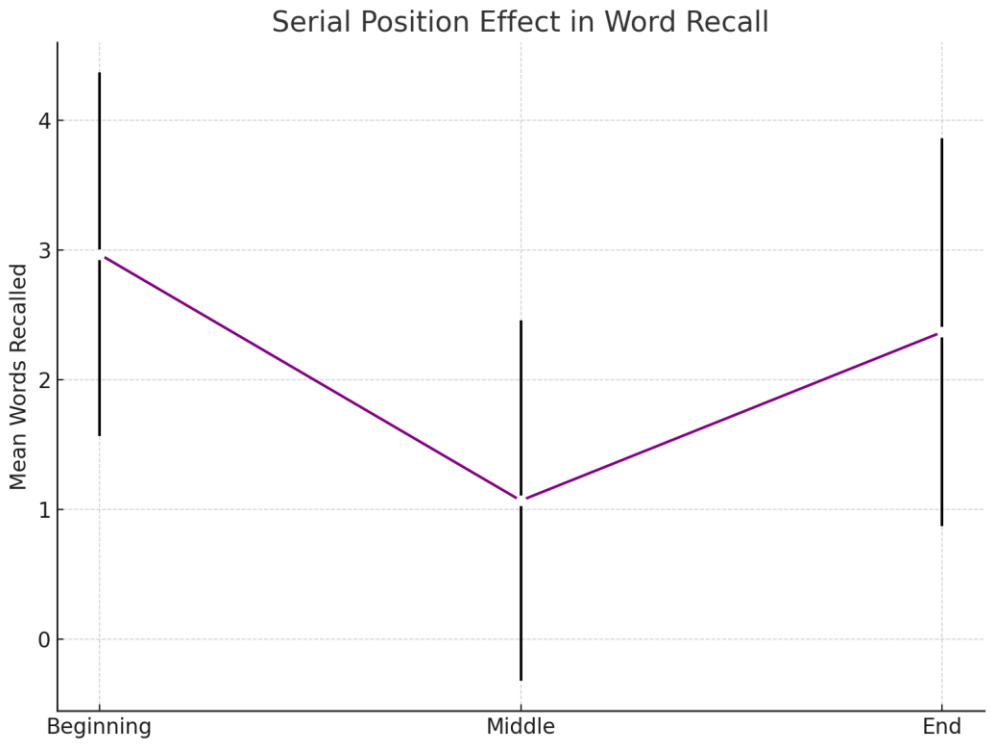
**Tables and Figures**

**Table 1** *Descriptive Statistics for Word Recall by Serial Position*

| Position | M | SD | Range |
|---|---|---|---|
| Beginning (1-5) | 2.97 | 1.89 | 0-5 |
| Middle (6-10) | 0.87 | 1.44 | 0-5 |
| End (11-15) | 2.13 | 1.67 | 0-5 |

Note. N = 30. M = mean number of words recalled out of 5 possible in each position.

**Figure 1** *Serial Position Curve for Arabic Word Recall*



# Appendix A

## Sample Word List:

| Number | Word | Translate |
|---|---|---|
| 2 | قيثارة | Harp |
| 3 | قوس قزح | Rainbow |
| 4 | دراجة | Bicycle |
| 5 | جبل | Mountain |
| 6 | حاسوب | Computer |
| 7 | شطيرة | Sandwich |
| 8 | فراشة | Butterfly |
| 9 | منارة | Lighthouse |

## Sample Mathematical Distraction Problems:

- 7 + 3 = ?
- 15 - 8 = ?
- 12 + 6 = ?
- 20 - 5 = ?

## Interface Screenshots: