Exploring How do Expectations Influence Learning

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Abstract. Memory is a core component of human cognitive functioning and is vital for learning, decision-making, and quality of life. This paper reviews the correlation between setting expectations and aiding memory, focusing on the effects of constructing, capturing, and adjusting expectations during memory on memory performance. First, the paper describes the basic principles and processes of memory and clarifies the role of setting expectations in memory. Then, the critical role of setting expectations in memory is demonstrated. Finally, the role of expectations on memory interference, memory extraction, and memory retention is discussed, as well as directions for future research.

Keywords: Memory Expectations; Memory Performance; Memory Interference.

1. Introduction

1.1. The importance of memory

Memory is a physiological and psychological activity every human carries out daily. The so-called memory is the process of recognizing, retaining, and applying our experiences, the process of encoding, storing, and extracting information. Long ago, memory aroused the interest and curiosity of scientists. Thanks to scientists' research, humanity has evolved from a single understanding of memory to the current distinctions between memory, such as long-term memory, short-term memory, working memory, declarative memory, and non-declarative memory. It is by relying on the ability of memory that human beings can learn, accumulate and apply all kinds of knowledge and experience to promote the development of history and social progress continuously.

1.2. Expectation theory and the role of setting expectations

Expectancy theory was introduced by the American psychologist Vroom in 1964 in Work and Motivation [1]. It is a theory that describes the motivation process by examining the causal relationship between our effortful behavior and the ultimate reward we receive, intending to select appropriate behaviors to achieve the ultimate reward. Expectancy theory suggests that individuals tend to adopt a behavior when they expect a particular outcome of that behavior and that outcome is attractive to the individual. Setting expectations is a thinking strategy we often use in our daily life that involves predicting future events and shaping expectations about reality. In most cases, setting expectations is beneficial as it helps us make better decisions, adapt better to our environment, and achieve our goals, which can be demonstrated later in the article. However, if expectations are too high or too low, it can lead to disappointment and frustration, affecting an individual's mental health.

1.3. Purpose and significance of the study

Memory is an integral part of being human and is vital for learning, decision-making, and quality of life. However, memory is unreliable, and we often need to remember or remember. In order to improve memory effects, researchers have explored how to help memory by setting expectations from different perspectives. This paper will review these findings and discuss the critical role of setting expectations in the memory process, thus clarifying the impact of expectations on our memory and how they can be applied to memory tasks.

This study has the following main implications: (1) While previous research has focused on the biological and neuroscientific mechanisms of memory [2], this study explores how to improve

memory by adjusting our expectations from a psychological perspective. (2) Expectation is a common psychological phenomenon in our daily lives, so the results of this study are expected to guide the fields of education, medicine, and advertising, helping us to use expectation more effectively to improve memory. (3) The field of artificial intelligence has begun to use expectations to improve the effectiveness of machine learning algorithms, for example, by introducing expectancy reward signals in reinforcement learning [3], and the results of this study may provide new inspirations and ideas for the field of artificial intelligence.

2. Fundamentals and Processes of Memory

2.1. Types of memory

Memory can be categorized as instantaneous, short-term, and long-term based on the time the memory content is retained [4]. Because transient memory is not the classification of memory that needs help in the focus of this paper, only an overview of short-term and long-term memory is provided here..

2.1.1. Short-term memory

Short-term memory is the part of the human memory system responsible for storing short-term memories of information. Short-term memory can store information for seconds or minutes and is one of the simpler components of the human memory system. Short-term memory is also known as working memory because it plays a vital role in processing information and performing tasks.

2.1.2. Long-term memory

Long-term memory is the part of the human memory system responsible for storing information for long-term memory. Long-term memory can retain information for hours, days, years, or longer and is one of the most critical components of the human memory system. Long-term memory can be divided into two categories: explicit and implicit. Explicit memories are those that we consciously recall and think about. Implicit memory, on the other hand, refers to memories that we recall and think of unconsciously.

2.2. Memory Process

2.2.1. Encoding

Encoding is the process of transforming external perceptual information into processable information within the brain. When we receive information from the external environment, the brain converts this information into neural signals that are stored in neural networks. Encoding determines whether or not we can store information in long-term memory. The attention and meaning of the encoding process have an essential effect on the quality and quantity of memory.

2.2.2. Storage

Storage is the process of holding encoded information in the brain to retrieve it when needed. The storage process involves persistent changes, which can be either in the modulation of synaptic strength between neurons or in the formation of new synapses. These changes strengthen the connections between neurons, and the information can be stored for a long time.

2.2.3. Extraction

Extraction is the process of retrieving stored information from the brain. When we need to use previously learned information, our brain searches and finds this information and extracts it. The extraction process can take place through recall, prompting, and relearning. The success of the extraction depends on the quality and quantity of the encoding and storage process, as well as factors such as context and situation.

3. Overview of Ways to Help Memory

3.1. Relevant papers on helping memory

There are many ways to help us enhance our memory in our daily life, and previous researchers have conducted many studies on this and have also suggested some factors that may affect memory. Table 1 is from some of the papers.

Table 1. Relevant papers on helping memory.

Number	Method	Paper	Author	Year	Citation
1	Memory aids to help with memory	The Role of 'Memory Totems' in Memory Enhancement	Meng Q.,	2019	[5]
2		The Influence of Phonological, Semantic, and Orthographic Processing on Memory Performance in Chinese Vocabulary	Sun et al.	2007	[6]
3	Evolutionary psychology helps with memory	The Evolutionary Psychological Effects of Sleep on Memory Consolidation	Shen J.,	2012	[7]
4	Material consistent with knowledge/experience is more likely to be remembered	When does prior knowledge disproportionately benefit older adults' memory?	Stephen P. Badham, et al.	2016	[8]
5	Effects of medication on memory	Enhancement of long-term spatial memory in adult rats by the noncompetitive NMDA receptor antagonists, memantine and neramexane	Phillip R. Zoladz, et al.	2006	[9]
6	Effects of isometric exercise on memory in older adults	Muscle tension induced after learning enhances long-term narrative and visual memory in healthy older adults	Kristy A. Nielson, et al.	2014	[10]
7	Efficacy of cognitive interviews (CI) compared to structured interviews in improving older witnesses' recall of events	How Effective is the Enhanced Cognitive Interview when Aiding Recall Retrieval of Older Adults including Memory for Conversation?	Katherine Prescott, et al.	2011	[11]
8	Action-object binding plays a crucial role in the representation of performance effects in immediate recall	Investigating the underlying mechanisms of the enactment effect: The role of action-object bindings in aiding immediate memory performance	Angeliki Makri& Christopher Jarrold	2021	[12]
9	The paradoxical relationship between schema and novelty determines whether memories can be remembered more easily	How schema and novelty augment memory formation	Marlieke T.R. van Kesteren, et al.	2012	[13]
10	Novelty aids memory	A predictive account of how novelty influences declarative memory	Jorn Alexander Quent, et al.	2021	[14]

The above papers have explored the effects on memory from the perspectives of memory aids, evolutionary psychology, and novelty. However, the study of how memory is aided from the perspective of an individual's psychological cues, which often account for a large part of the influence of an individual's psychological factors in methods of aiding memory, has yet to be addressed. Attempting to search the papers on helping memory from the perspective of one's psychological settings over the years, there are relatively few papers related to one's psychological construction, as shown in Table 2.

Table 2. Papers on helping memory from the perspective of one's psychological settings.

Number	Paper	Author	Year	Citation
1	Concatenated Exploration Aiding Theoretice Memory by Planning Well for the Future	Robert A. Stebbins	2006	[15]
2	The effect of message modality on memory for political disinformation: Lessons from the 2021 U.S capitol riots	Brenna M. Davidson& Tetsuro Kobayashi	2022	[16]
3	Improving Students' Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology	John Dunlosky,et al.	2013	[17]
4	Knowledge Is Power: Prior Knowledge Aids Memory for Both Congruent and Incongruent Events, but in Different Ways	Andrea Greve, et al.	2019	[18]

Paper 1 deals with the correlation between an individual's mental form of exploration through crosstalk and the specific memory content of ethnography, paper 2 examines the correlation between the specific group mentality of partisanship and selective memory; paper 3 refers to 'self-interpretation' as a form of psychological cueing that can strengthen memory, and paper 4 describes the correlation between the memory of events that meet psychological expectations through In paper 4, the study found that events that conformed to psychological expectations were more likely to be remembered. Further research into the above papers exploring the correlation between individual mental constructs and memory has established that individual mental constructs help memory more often than not by setting expectations. For example, Paper 4 concludes that events that meet our expectations are more likely to be remembered than irrelevant events, which shows that setting expectations plays a vital role in memory.

3.2. The role of memory in setting expectations

In many psychological and neuroscientific studies, general principles involving human memory and decision-making have been explored. It has been found that people usually set expectations based on their own experiences and memories and that memory also influences our predictions of future events. However, we often tend to predict future events based on our past experiences, which may lead us to underestimate or overestimate the likelihood of certain situations. Memory accuracy is crucial when setting expectations; errors or incompleteness in memory may lead to biased expectations. Therefore, we must focus on acquiring and storing information to set expectations more accurately. At the same time, we can also improve the accuracy of setting expectations by communicating and sharing experiences. In conclusion, setting expectations is an inevitable thinking strategy in our daily lives. Memory plays a vital role in setting expectations because it can influence our predictions and shape our expectations about reality.

3.3. How to set expectations

Setting expectations is setting short-term and long-term goals to help maintain self-discipline and motivation. The papers in Table 2 are simply papers that, at one point, establish some correlation between setting expectations and helping memory—however, a systematic elaboration of how expectations are set needs to be done. Table 3 adds to these shortcomings.

Table 3. Papers on a systematic elaboration of how to set expectations

Number	Method	Paper	Author	Year	Citation
1	Weighting of desired attitudes through potency measures	Expectancy Theory and Job Behavior	Edward E. Lawler III&J. Lloyd Suttle	1973	[19]
2	Implicitly building expectations, e.g. using information inherent in sound movement to direct attention to specific moments associated with specific locations	Auditory Target Detection Is Affected by Implicit Temporal and Spatial Expectations	Johanna Rimmele,et al.	2011	[20]
3	Moderating expectations through social behaviour	Harnessing the Placebo Effect: Exploring the Influence of Physician Characteristics on Placebo Response	Lauren C. Howe, et al.	2017	[21]

In addition to the methods of setting expectations given in the papers in the table, in our daily lives, we can help ourselves to set expectations in the following ways. Firstly, identify the goals to be achieved and ensure they are clear, measurable, achievable, relevant, and time-bound (SMART principle). Next, break down long-term goals into short- and medium-term ones to better track progress and achieve them gradually. Also, set priorities for your goals, allocate enough time and effort to each goal, and create a specific action plan that describes how you will achieve them. Finally, assess your progress regularly, adjusting expectations and action plans periodically to suit new situations.

4. Factors Affecting the Role of Expectation Construction and Memory

4.1. Expectation construction and capture

4.1.1. Predictive information

Predictive information is information that can help us predict future events. The brain uses this information to build and capture potential memory cues when we form expectations. This predictive information comes from past experiences, cultural backgrounds, and social environments. Processing predictive information can help us encode and extract memories more efficiently, thus improving our adaptability in different situations and tasks.

4.1.2. task relevance

The process of constructing and capturing expectations is also affected by task relevance. Task relevance refers to the degree to which information is relevant to the task at hand. When faced with a particular task, our brain is more inclined to focus on and process information relevant to the task. This selective attention helps us focus our limited cognitive resources on the information that is most helpful for task completion, thus improving the efficiency of memory encoding and extraction efficiency.

4.1.3. Internal generation and external motivation

Expectations can be constructed and captured based on internally generated information and external incentives. Internally generated expectations come from our thinking, emotions, and motivations, influencing how we process and remember information. External incentives, on the other hand, include a variety of stimuli and sources of information in the environment that also influence our expectation construction process. Combining the factors of internal generation and external

incentives, our brain can adjust expectations in a changing environment to more effectively encode and extract memories.

4.2. Expectation adjustment

4.2.1. Expectation adjustment and memory encoding

Expectation adjustment refers to updating our expectations based on new information and the actual situation. In the memory encoding stage, expectation adjustment can help us focus on information that does not match the expected situation, thus improving the encoding quality of such information. When we encounter information that violates expectations, our brain generates more muscular neural activity, which helps us process this information more deeply and store it more permanently.

4.2.2. Expectation adjustment and memory extraction

Expectation adjustment also plays a vital role in the memory extraction stage. When we try to recall information from the past, our brain generates corresponding expectations based on the current task and situation. These expectations will serve as retrieval cues that guide us to search for information in memory that matches the expectations. Memory extraction becomes smoother and more efficient when we find information that matches our expectations.

4.2.3. Expectation adjustment and memory retention

Expectation adjustment affects memory encoding and extraction and is closely related to memory retention. When we face new tasks and challenges, we must constantly update and adjust our expectations to adapt to the changing environment. In this process, we may reassess and integrate some of our memories to align them with current expectations and needs. This mechanism of memory updating based on expectation adjustment helps us to achieve long-term cognitive adaptability and learning ability in complex environments.

5. Future Research Directions

This article proposes a new research direction on how to help memory by setting expectations, which can be better applied in each of the following fields.

(1) Neurobiological mechanisms: to study how setting expectations affects neural networks in the brain and thus aids memory. This may involve interactions between neurotransmitters, synaptic plasticity, and brain regions.

(2) Individual differences: exploring differences between individuals in the effects of setting expectations on memory. This may include gender, age, cultural background, and cognitive ability.

(3) Optimal Expectation-Setting Strategies: examines which expectation-setting methods are most effective for memory and how expectation-setting strategies can be adapted to individual differences.

(4) Combination of Expectation and Other Learning Strategies: To explore the combination of expectation setting with other learning methods (e.g., self-interpretation, questioning, spaced practice, etc.) to improve learning outcomes.

(5) Long-term memory: to study the effects of expectation setting on long-term memory and how expectation setting can help people retain what they have learned over a long period.

(6) Digital Learning Environments: To study how expectation setting can be effectively used in digital learning environments (e.g., online courses, mobile apps, etc.) to improve learners' memory performance.

(7) Interventions and Educational Practices: To explore how research findings on expectation setting can be applied to real-world educational environments to improve teachers' teaching effectiveness and students' learning outcomes.

6. Conclusion

Setting expectations can have a significant impact on memory formation and storage. Individuals with certain expectations about upcoming events may pay more attention and notice relevant information, which can be more easily converted into long-term memories. In addition, expectations can stimulate emotional responses in individuals, such as excitement and curiosity, which may further facilitate memory formation and storage. Research has shown that setting expectations can facilitate memory storage and improve memory accuracy. For example, when individuals have certain expectations for a memory task, they may value the relevant information more highly, which makes it easier to convert it into long-term memory. In addition, when individuals have certain expectations about their memory performance, they may try harder to memorize relevant information, thus improving memory accuracy.

This paper provides an overview of how memory can be aided by setting expectations, mainly in terms of how memory can be aided and how expectations can be set. Firstly, the forms of memory are analyzed, while the main focus is on long-term and short-term memory, as well as the three stages. From the point of view of helping memory, it can be done through aids, schemas, and drugs, and setting expectations is one of them. This leads to the core of this paper, which is to help memory by setting expectations. Based on this, how to set expectations is analyzed, and the SMART principle is mentioned. Finally, a brief overview of the factors that influence the role of expectation construction and memory is given.

In conclusion, helping memory by setting expectations is an interdisciplinary research field involving psychology, cognitive science, neuroscience, and other fields. This paper reviews research on improving memory performance by setting expectations, focusing on the effects of constructing, capturing, and adjusting expectations during memory-on-memory performance. Future research could further explore the role of setting expectations in different age, cultural and disciplinary contexts and how these findings can be applied to practical educational and rehabilitation settings to improve our learning outcomes and quality of life.

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