

Memory studies of chunking and decay of memory

Haozhe Feng *

Beijing royal School, Beijing, China

* Corresponding Author Email: fenghaozhe@st.brs.edu.cn

Abstract. Memory is the basis of learning and work for humans, and is generally divided into short-term memory, working memory and long-term memory. The current study demonstrates the physiological basis of neuronal memory formation and processing. However, neuron theory cannot explain all human memory phenomena. There is also a lot of controversy about the relevant assumptions. Memory is an important aspect of human brain biology, and many researchers have spent their entire lives studying the components of memory. Over the past few years, a number of articles have appeared on memory that is critical to anyone learning memory and should be of interest. Memory, as an important aspect of human life to work and learn in this world, is receiving increasing attention, focusing on its function and utilization. The authors review the literature on memory decay and chunking techniques through targeted articles on many aspects of human memory. In recent developments, the author will talk about chunking, learning and synaptic plasticity.

Keywords: Long-term Memory, Short-term Memory, Curve of Forgetting, Working Memory, Chunking.

1. Introduction

Memory as a function in the brain to store and reuse the information which memorize or reuse the information to deal the activity. Human use memory to better apply the work and study. Memory can generally separate in short-term memory, working memory and long-term memory. Short-term memory meaning that memory will store in brain in a short time (from second to hour), and those memory are ease too forgot and decay. Long-term memory represents that information can store in brain for a longer time, long-term memory is easy to retrieves and store more time. The different between two sorts of memory are the time for remain and the place those memory stored. The function of memory and its form of memory in psychology and biology aspect (figure 1).

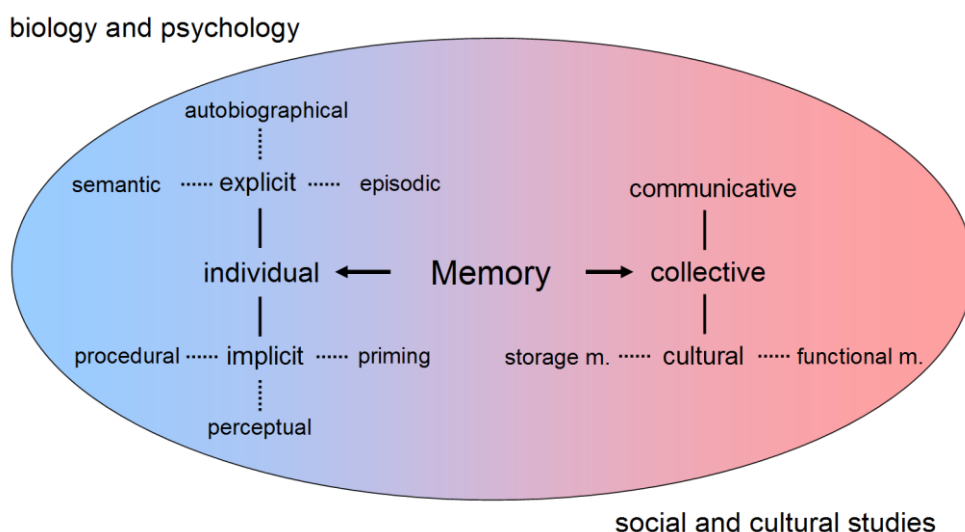


Figure 1. Biology and psychology of memory.

Implicit and explicit memory need conscious take in, focused recall of encoded information, previous experiences, emotions in places and clear concepts [1]. Implicit memory can be subdivided into three parts: an acquisition which learn from concussions, consolidation which protect memory for a long time, and retrieval which recall the information [2]. Explicit memory can also be roughly

divided into two types with different functions; episodic memory, which stores specific personal experiences, and semantic memory, which stores factual information.

Memory can be thought of as a random assessment memory in a computer which uses as an information process and storage system. It has two systems explicit and implicit which include short-term memory, long-term memory, sensor memory, and working memory [3]. The contribution of this function relay on the neuron. Neurons as the basic or physical utensils of the memory to form and react to each other. When the neuron reacted to others, it will generate the stimuli to the cortex an electron wave to stimulate others. This kind of effect was the fundamental basis of memory. Since the research on neuron behavior was appear in neuron scientists' eyes, many theories appeared about the working function of the memory. One of most theory get general approved was a group of memory working for a certain memorized object.

Working memory acts as a ram to collect and retrieve the information as a place that calculates the information. The information that humans used to know the events since by the organism which sends a message or stimuli to neuron transfer to the hippocampus which working memory placed, working memory encodes and retrieval the information in the brain have to phase the surrounding. Working memory not only deals with the information received from outside but also retrieves information from long-term memory. Finally, the information which gets attention will transfer and store in pallium [4].

Declarative or explicit memory is information that consciously notices [5]. Declarative memory can separate as semantic memory and episodic memory. Semantic memory refers to memory encoded by meaning and thought [6]. And, episodic memory means memory that commonly appears as memory collected by time and space [7]. Non-declarative or implicit memory is memory stored unconsciously stating from the information input [8]. For example, people commonly suddenly notice something or know something or speak some word that does not know its meaning, this is a simple unconscious learning or retrieval.

When memory responds unconsciously to a particular reaction called priming. Priming provides not every memory will respond consciously [9]. Priming particular for memory represents a skill that commonly happens unconsciously [10]. Take penmanship as an example, when you write a word or sentence, you never focus on muscle movement and finger strength because you cannot deal with so much information in the human head.

2. STM (short-term memory) & LTM (long-term memory)

2.1. STM

Short term memory refers to memories that can remain in the brain for a few seconds to a minute. So, its capabilities are very limited. In 1956, George A. Miller's (George A. Miller) experiments showed that the human short-term memory storage capacity is 7 ± 2 objects. Also known as the "magic number 7 ± 2 ". Recent research shows that the ability of short-term memory should not be 7 ± 2 but about equal to 4 [11,12], and the method that can increase the capacity of working memory is also called chunking.

2.2. LTM

The storage of memories in sensory and short-term memory usually has very strict volume and time requirements, which means that the storage of memories is not instantaneous. The difference is that the process to help neuron connection and re-unit formation of long-term memory is eventually established, which can store more information and keep it for a longer time period. Likewise, it can store these long-term preserved memories for much more time long, even take them as whole life.

The multiple memory model or Atkinson-Shiffrin memory model was published by Atkinson and Shiffrin in 1968. But this multi-storage model is considered by many scholars to be too simple and has many problems. Atkinson and Shiffrin argue that long-term memory is actually composed of several distinct subcomponents, the most serious of which are motor memory and procedural memory.

The multi-memory model gives a thought that rehearsal is the only way information can be stored in long-term memory, but new research shows that humans have the ability to remember things without rehearsal. Evident also presents all of the memory storage for an isolate unit, where the underlying evidence shows otherwise.

3. Recent study of chunking.

Since the 1940s and 1950s, the theory of "chunking" has been thought to be central to many perceptual methods of learning and cognition in humans and animals. A block is defined as a group of cells that have strong relational ties to cells in other blocks. Fernand Gobet and colleagues summarize the main sources of evidence for chunking surrogacy. [13] They define two forms of segmentation based on the function and method of assuming segmentation: the first type is goal-oriented segmentation that is deliberately controlled under strategic control; the second is automatic and continuous. And chunks associated with perceptual processes. De Groot and Miller, who were the first to define a mechanism for chunking, provide information metrics for cognitive systems based on his concept of "chunks", where each chunk will absorb a single information element from the surrounding environment into an isolated and in consecutive system units. [14]

Later Fernand Gobet and his colleagues defined two general types of chunking similar to Fernand Gobet and his colleagues: goal-oriented chunking and perception-oriented chunking. Take method of loci as an example, imagine that the word to be memorized is placed in a certain position in the room, this position is related to the word you need to memorize, which makes the word to be memorized easier to be noticed and stored in your memory. The pillars used to hold information in Loci are used to aid retrieval and provide order, which helps the memory to be triggered more easily. The memory then deepens with repeated repetitions to the point where it can be recalled later without the need for loci. memory.

4. The sin of human memory

There are two versions of the Seven Deadly Sins of Human Memory. The first paper, written by Schacter in 1999, investigated how memory biases can get us into trouble [15]. He categorizes memory errors into seven basic sins: transience, absentmindedness, blocking, misattribution, suggestibility, bias, and persistence. Transience, absentmindedness, and blocking are three different sorts of forgetting. Misattribution, suggestibility, and bias are 3 types of distortions. Persistence is concerned with intrusive recollections that are difficult to forget. Schacter uses cognitive, social, and clinical aspects to mention that those flaws in system design are not the by-product of otherwise adaptive features of the memory.

In 2020 Schacter wrote new research about the seven sins of human memory to provide a supplement for the pre-article. In this article, the author summarizes the increased understanding of nature, consequence, and adaptive functions of memory sins. Since the time transfer, a memory which we already encoded and solid greatly ever we consciously searching for it immediately. This is called Transience-forgetting.

Memory is decay during the time and is coming more and more reliable. The term forgetting was first coined from Ebbinghaus (1885)'s famous study of forgetting, where he attempted to study nonsense syllables. Memory loss may happen as longtime not using it. The memory whether or not retrieved and rehearsed is the key weather to remembering it.

Short-term forgetting can result from a problem with trial procedures storage processes, or both. Forgetting may occur because of insufficient attention to the stimulus during encoding or retrieval, or because the information involved is superficial. Those forgetting events associated with inattention during encoding or retrieval attempt to think as absent-mindedness fails. Even though spending much effort and time on the encoding, memory has not been lost overtime, it may sometime happen that the memory temporarily blurs. When people provided the cues or hints that are related to but are

nonetheless unable to recall them. The retrieval blocks have occurred. Which situations in some form of memory are present but are miss-attributed to an incorrect time, place, or person. Source confusion, cryptomnesia (absence of any subjective experience of remembering), and false memory (falsely recalling or recognizing objects or occasions that never occurred) are three forms of misattribution.

Illusory memories may not only react spontaneously when a current situation or test item is conceptually or perceptually similar to a previous one but also a response to suggestions that are made when one is attempting to recall an experience that may or may not have occurred. Suggestibility in memory refers to the tendency to incorporate information provided by others, such as misleading questions, into one's recollections. Memories of past experiences may be colored by present mood and emotional state. Bias refers to the distorting influences of present knowledge, belief, and feeling on recollection of previous experiences. Persistence is shown by invasive remembering of traumatic circumstances, introspection over negative signs and events, and even by chronic fears and phobias.

Forgetting is not a bad thing, but a good thing, a tool that can help us keep learning. If everyone is hyper-amnesiac, then the whole society will not be all geniuses but a bunch of people who can't take care of themselves. Because amnesia is a memory cleavage protease disorder. This causes patients to involuntarily continue to recall information they have seen without stopping. This causes them to be unable to concentrate on anything, and their excellent memory. As a result, they cannot adjust their neurons as quickly as ordinary people. Forgetting helps us filter and filter information to help us better deal with the things around us instead of focusing on one aspect. As we continue to forget, we continue to focus on this Continued learning in terms of aspects allows us to gradually understand the matter. Although forgetting makes our learning painful, it cannot tell the brain that the information is not needed for the things we want to keep for a long time. This leaves us only by repeating the piece of information. learn relevant knowledge.

5. Memory encoding and aging: a neurocognitive perspective

BP neural network is back-propagating, mainly composed of three parts: input layer, middle layer, and output layer. The number of nodes in the input and output layers is relatively easy to determine, but the determination of the number of nodes in the hidden layer is a very important and complex problem.

It seems that older adults' memory encoding can be the effect by the information input cognitive system. Older adults commonly appearing vision and hearing decline, it seems that the encoding decline by the cognitive input. Memory encoding decay can be stimulating by providing noise to young people to achieve.

Better performance means higher initial coding depth and accuracy from the perspective of memory's process beliefs. That is, the encoding was happen before noticing once meaning and dealing with meaning.

Through linguistic material, individual words, sentences or text passages sift out easy-to-understand meanings or create material information meanings that can be processed in multiple ways, from eye recognition to very deeply integrated and comprehensive readings involving prior knowledge and theoretical reasoning. The "levels" of these processed results are crucial for later memory; however, the processed results of different varieties are not reusable from another type. Humans have the ability to sense and understand snowflakes and kaleidoscope patterns easily however it is often difficult to remember what they look like. That's because we can't give snowflakes and kaleidoscope patterns a meaning. Young people have a special ability to construct meaning from meaningless semantic material probably because the age effect of meaningless visuospatial shape on working memory at the semantic scale is favored over linguistic reading stuff [16].

6. Binding and distinctiveness for the encoding

Memory as well known as the human brain exerts performance which is crucial for people to understand how memory works in the human brain and how to improve the function of the brain. In the past time, there has a theory about the human brain just uses ten percent of utility, which means that humans still have nineteen percent of capacity and can use it as improve the brain. But, this well knows theory was felt because the human brain acclimates using twenty percent of the energy used in the body. What if the brain gets 100% of utilizing the body needs how much energy to supply for the brain? Also, the theory of 10% was the shadow place during computed tomography and magnetic resonance imaging scans. The light bulb means the electron flow, which does not mean shadow place was not utilized. Neurons after sending a message need time to re-collect the messenger in the neuron. This is the reason that the human brain was utilized the brain 100%. Memory as part of daily life has many theories about its function, but no one can oversight the importance of memory. As a crucial position affect human learning, language acquisition, motion mimic, and verbal remaining.

In 2013, Jonas Frisén and his team discover that the brain does not stay permanent but changes daily. Every day, there have 700 a neuron is born in the hypothalamus and switch in the whole brain as 1.75% change. The newly born neuron plays an important role which helps synaptic plasticity. The human neuron which considers ancient remain which undergone a 'phylogenetic reduction' from amphibians to humans. In an adult, hippocampal dentate gyrus was be thought of as a function of conjunction and consistent ability which crucial for human synaptic plasticity.

During the changeable world, actively dealing the complex and hard problems will help adults neuron adjust. The newborn neuron can deal with the complex problem of adjusting and conquering the world. Another way for synaptic plasticity was the improvement of BDNF. When doing sport or exercise for a long time, the BDNF will generate so sport is crucial for adult memory improvement. For example, running exercise can improve cognition development, formation of anterograde memories, and mood, alongside enhancing hippocampal neurogenesis [17]. In the laboratory experiment, comparing the mice which average running 78 miles with move-less mice, the memory retrieves appeared to 1.5 to 2.1-time improvement. During the study of the running exercise with memory retrieval, doing aerobic exercise after a 4-hour study will help hypothalamus recollection and better help the next time study. The study will not influence by the exercise about memory retrieval. Considering physic exercise the memory encoding may change after the memory remains, but researchers believe aerobic sport can help the consolidation of human memory because, during the exercise, the body will trigger BDNF, PRPs which is a plasticity-related product), noradrenaline, and dopamine, among other substances that improve neural plasticity. That material will greatly help the memory consolidation after the sport.

7. Conclusion

Memory is critical for learning and working, a better understanding of the knowledge of memory will give more theory from many area people for better research about human memory. Since memory subject development, the mnemonic and technique will help people better study and work in real life. As I imagine, when people have a better ability for learning, more talented people can observe in different areas to improve science improvement. From some theories, memory can be thought of as learning. Another theory from evolution says learning is more important than memory because memory is after enveloped function or organism. In billions of lives before, many creatures had not memory systems. But, there can still announce that memory is the symbol that evolution changed from group to individual. In the next few years, human brain technology will continue to deepen the understanding of human thinking with artificial intelligence. The secrets of the human brain will eventually be understood, which means that people may achieve faster thinking and stronger. With regard to memory, however, current research may only be the tip of the iceberg in understanding memory. Whether the complexity of human consciousness, memory, and learning can be simply

explained by structures such as neurons and synapses. The controversy is still very high. The future needs to find suitable animals to model memory and learning.

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