

Memory
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Lecture - 25
Forgetting - I

Hello, I welcome you all. In the lecture series on memory, today we are going to start a new topic: forgetting. We have been talking about forgetting since our first lecture, that some information we forget, and forgetting information can be beneficial. Under certain circumstances, under certain scenarios, forgetting is good. But if forgetting happens too much, then forgetting makes our life and day-to-day activities challenging. This problem arises commonly and has been seen frequently in the elderly. This is one of the major causes of disability in the elderly as well. Now, the problem of forgetting: why is an individual forgetting information? What we previously discussed is that forgetting and decay are natural processes, processes where an individual tries to update or maintain information.

Where an individual ensures the information we do not want, the information which is irrelevant to us, we wash it out, we do not keep it because we have a system where we have to register, encode, and store information from childhood memories to our present scenario. As you can see in the cartoon, the old lady is confused. She is forgetting what she is supposed to buy. Where is the list of grocery items?

What items did she mention in the list? And such confusion. It has become part of their everyday life. These individuals suffer from forgetting. These individuals struggle with remembering items.

The question we should be asking ourselves is: Is forgetting good? Is forgetting bad? Why is forgetting happening? What are the underlying neural mechanisms of forgetting? Is it a matter of retrieval failure?

Is it a matter of information that doesn't exist, and that's why retrieval is not happening? There are many such questions to ask on this topic. Let me walk you through the basic understanding of forgetting. What is forgetting? The loss of information from our long-term memory.

The memory, which is a repository of stores the information for an indefinite period of time. The repository keeps information about our loved ones, dear ones, birthdays,

anniversaries, and relevant information like where I have kept my car keys, where I have kept my house key, and where I have put my wallet. The loss of information from long-term memory Can be temporary or permanent?

The temporary loss, the question which researchers have been trying to understand, is when does the temporary loss occur? To what information is there a temporary loss? What is the nature of the information where the memory is going for permanent loss? Is there a distinction between the nature of the information? Can the temporary loss be overcome?

Because we know the permanent loss of information cannot be overcome. Because the information doesn't lie there anymore. It becomes very difficult for an individual to trace the entire set of memories and ensure that the amount of information which we have encoded and stored is going to remain there forever. It is even very challenging for an individual to ensure that the amount of information present in his or her repository at the time of retrieval can be retrieved. Such challenging questions, such challenging concepts and ideas, require deeper insight and a bit more understanding in this area.

Many systems seem to evolve. as an aid for remembering and encounters with predators. The information which we were trying to encode and store for our survival. At the time of survival, when our ancestors were encountering predators, how to fight, how to safeguard themselves, what kind of defense barrier they had to build against predators. And imagine if they forgot this information, our generation would have still been living in caves.

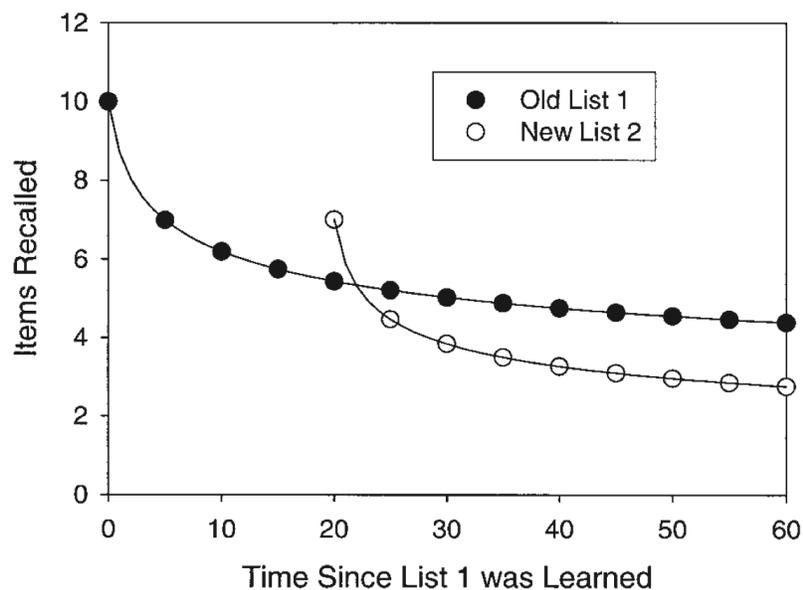
The evolution, no doubt, has helped us to evolve. But at the same time, the memory system has kept on evolving and ensured to keep mankind safe from the threats present in the environment. Here we prioritize the information. Here we select the information. Here we make the hierarchy.

We select which information we need and which information we do not need. The information which is less relevant for us, the information which is irrelevant for us, we try to erase it from our memory system. Now some erasure is good, but some erasure can lead to catastrophe. If you all remember the defense mechanism proposed by Sigmund Freud, repression, repressing the memories about traumatic events. One such erasure is there.

The question we are asking is: Is forgetting permanent in nature or temporary in nature? Is it good or is it bad? Rather than diving into such questions, it is better to slowly and gradually understand the nature of forgetting. The nature of forgetting, if you all remember, we discussed it long back when we were talking about the Hermann Ebbinghaus experiment, a classical experiment. You have learned something, and when you try to retrieve it, the forgetting starts and it decreases exponentially.

The same pattern, forgetting, items recalled here, you see it is decreasing exponentially. And the decrease in the recall reaches an optimal level. It stabilizes over a period of time. The two pieces of information, the new list and the old list. Both are trying to become stable.

This curve which you are seeing on your screen for the old list and the new list is the curve of forgetting. The rate at which people are forgetting the information which they learned earlier. This curve of forgetting has been constant for different kinds and amounts of information. The nature of information is important towards the forgetting list. Now, while talking about the nature of information, Jost's law is important. Jost's law says that if two memories are there and both the memories are equally strong, or both the associations are equally strong, then the old association or the old memory will be more durable, will be more robust.



Source: Wixted, J. T. (2004). On Common Ground: Jost's (1897) Law of Forgetting and Ribot's (1881) Law of Retrograde Amnesia. Vol. 111, No. 4, 864-879 DOI: 10.1037/0033-295X.111.4.864

And less likely to be forgotten. Now, when we are talking about this, we have to understand that a similar aspect is happening in fear memory and fear extinction. Fear memory in conditioning modeling is where we learn about fear in a lab, and when we learn about safety procedures, it is safety learning. Building safety memory on day 2, then the two memories compete with each other. If the old memory impression comes back, this means there is a relapse of fear.

If the new memory response comes back, this means it has overwritten the old memory, and the safety memory returns, preventing relapse. In any type of counseling session or intervention used with traumatized individuals, the problem with trauma, post-traumatic stress disorder, panic disorder, anxiety, and related disorders, relapse is a challenge. So, understanding such phenomena gives us insight into why Why new learning or new information is not formed so robustly or strongly by people? And why the new learning and new memory are not so durable in nature that they can override the previous memory?

Certainly, when we talk about the law, we must even ask ourselves, what are the boundary conditions of memory? The nature of the stimuli, the nature of the information, the nature of the memory itself that is being formed. As time passes, we have seen that the memory which remains, which stays till the end, becomes more and more resilient over time. And this is the reason why individuals with PTSD, post-traumatic stress disorder, Form a pathological memory, and as time passes, it becomes more and more resilient to treatment.

We discussed the classical experiment of Hermann Ebbinghaus earlier. He used the method of the memory drum. But instead of talking about forgetting, he talked about how much information we are saving. How much information is being saved after the loss? So, he came up with the forgetting curve, which is extensively used to this day, and another contribution was the savings method.

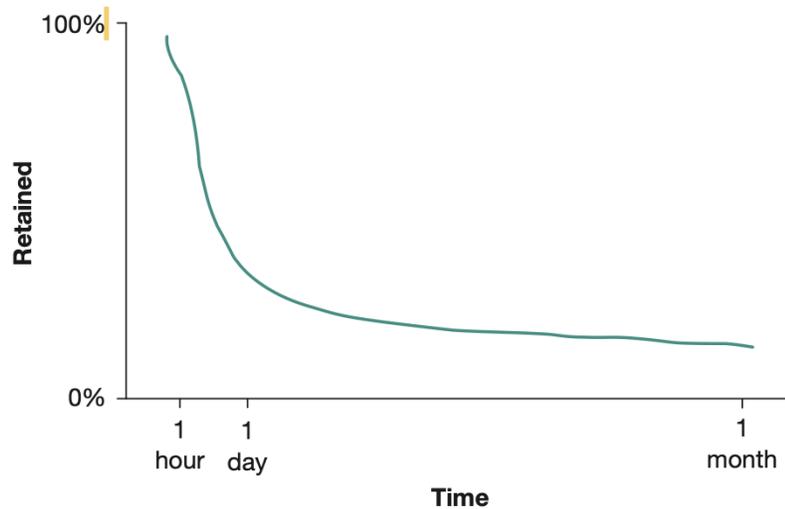
Using this savings method, one can figure out how much information is going to be preserved after the loss. After the forgetting. So, how much was saved from one study session to the next one? Memorizing the list of nonsense syllables until he made no mistakes indicated that he had learned the list. Accuracy is 100%.

No error. No loss of information. He retrieved it immediately and then retrieved it again after some time. The interval he varied from a study session to the test session ranged

from one hour to one month, and he observed that there is an exponential decline. This exponential decline, he called it the forgetting curve.

This is the way in which people are forgetting the information. And he calculated this saving method using a log function. So, what was the formula for that? b constant, saving constant. The amount of information being saved is equal to $100 \times \text{constant } K \text{ upon } \log T$. T denotes the time in minutes.

As we said, from hours to days to months. So, in a month, how many minutes are there? One month, equals to 60 minutes X 24 hours X 30 days, and the sum is going to be 18 24 32 16 19 4 2 2 3 4. 4, 3, 2, 0, 0 minutes.



Source: Rudmann, D.S. (2018). Learning and Memory (First Edition). Sage Publications

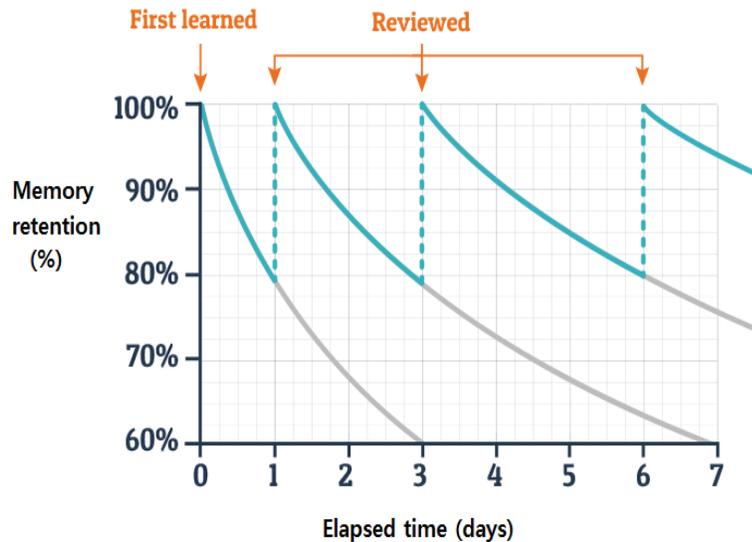
What is the decline? How much decline is there? So, $\log 4, 3, 2, 0, 0$ to the power of C constant. The amount which we get indicates this value. The retained information.

X, or you could say B. This is what we are going to get. Now, let us discuss the saving method, what he proposed. So, first you have learned this, then you have reached 100%, then you try to review this. So, memory retention, if you see, indicates how much information We have retained it.

Now, the same method reduces the amount of time required to relearn the list. The more retrieval you do, the less time you will take to relearn the list next time. And this helps an individual. Why? Because of familiarity with the list.

Because of the frequency of the task itself, you have done overlearning. The greatest saving is re-learning carried out within an hour. Within 60 minutes, if you are doing it,

you will find that the maximum saving is being done. More than 80% of the information can be retrieved from the original learning session. There is a large decline in saving until a plateau where retention takes hold, a large decline.



Source: Rudmann, D.S. (2018). Learning and Memory (First Edition). Sage Publications

This is the decline. Earlier, we have seen that decline, which reached roughly 20 to 25 percent. The effect of forgetting lessened over time. What does this mean? It means that as time passes, the forgetting stops.

It reaches a stable level. The information does not decay after that period of time. Definitely, the decay has already been more than 80%. But the information that remains becomes resistant over time. As a result, the forgetting lessens.

Abhay was even reported, though he was not able to remember the entire list of items, he demonstrated that some information he is able to retain and retrieve, only because there is a saving. The reason for retrieval is that there is a saving, and saving has been done. Less time is needed to relearn the list than to learn the entire list. What does this mean? If you are relearning the list, you will take less time than if a new list is given to you.

Why? As we discussed earlier, frequency and familiarity. Familiarity with the list will help you relearn the list in less time. You may not require the same amount of time as you did when learning the original session. Why has the saving method been criticized when Ebbinghaus beautifully depicted that some information is being saved?

Because the method that Ebbinghaus reported was the saving function. But researchers believed there could be numerous measures that could be precise indicators of the amount

of information that has been decayed, forgotten, or saved. It was also unclear from Ebbinghaus's design whether the dependent measures are measuring retention in the same manner or not. There are so many dependent measures, and all these dependent measures are doing the same thing.

They are measuring the saving of information. So the question arises: are these measures of these different methods the same or different in nature? The issues of measurement in the presence of retrieval cues that may help in retention or divided attention tasks that were in the performance. This even resulted in two problems: the saving method. First, retrieval cues, relearning, or overlearning when it is happening.

The items previously presented act as a cue, a retrieval cue. As a result, it helps in retention. Less time is taken. All the attention has been divided. How should the delay between different retests be calculated?

How can we calculate the delay between the tests? So, the passage of time, the amount of time that has passed, time on some relative index to some other variable, or the presence of intervening events. Let me summarize what we have studied. Forgetting. Forgetting is a part of human memory.

It plays a role in updating and maintaining information. It helps in filtering out irrelevant information from our system. However, for the elderly, forgetting is a big challenge. Forgetting keys, forgetting to lock the car, forgetting to lock the house door, forgetting the wallet, forgetting medical trials, or forgetting the doctor's appointment may result in a catastrophic event.

The nature of forgetting and the different types of forgetting we discussed. We even discussed when the two types of memories are of similar strength; then, the memory which is robust in nature leaves an impression, and the memory which is weak in nature just gets forgotten. The memory which leaves an impression over a period of time becomes resistant to change. We even studied Herman Ebbinghaus's curve of forgetting and his contribution to the forgetting-saving method. We even tried to understand the rate of forgetting, at what rate the information is getting forgotten, and why the method of saving is being criticized.

The reason for criticism is studied. With this, I will stop here, and in the next lecture, we will talk about forgetting in further detail. Thank you.