

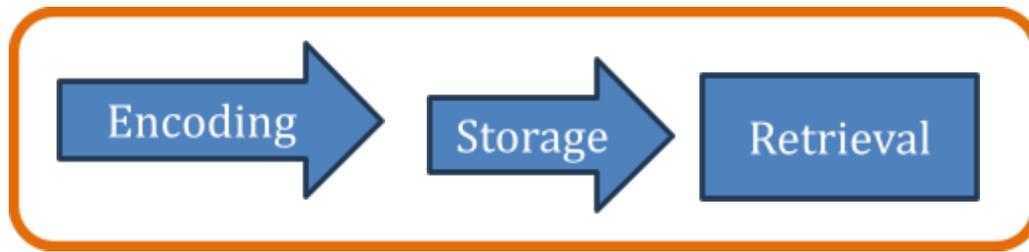
Memory
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Lecture - 11
Retrieval of Memory - I

Hello all, I welcome you all in the lecture series of memory. Today we will start the lecture number 11. In this topic, this is a week 3 course and in this week 3, we are going to study about the retrieval of memory. Retrieval is a unique process of memory processing and this also plays a very crucial role in the memory processing at the time of encoding, storage and the third stage retrieval. Retrieval encoding and storage doesn't have any meaning if you are not retrieving the information.

That is why retrieval holds a very special place in the memory processing. Now, a common example could be taken is that most of the time we go to the mall, shopping complex, market areas and what we do, we park our cars and then we forget where we have parked our car. So, we encode some information that we are going in the parking lot. We store this also that we have stored our car in the parking lot. However, at the time of retrieval, we fail to retrieve at which parking space we have parked our car and that is why you may have encountered several times that the parking spaces are generally been encoded with pillar numbers so whenever you park a car you remember the pillar number near which you have parked your car because similar color of cars could be hundreds of car would be there The number may vary.

However, the confusion comes when the hundreds of cars are being parked in a parking area and then you have to do a search. So, one thing is very clear and earlier also we discussed about this aspects in the introduction to memory and in neuropsychology of memory that information when it is getting stored in the long term memory, it doesn't store at a specific brain region. It gets scattered at different parts of the brain. Particularly when the information is getting old, it becomes independent of specific brain structures. So retrieval means the general act of recalling or recognizing something from the memory.



So what basically we do, we recollect the information. And if you all remember in the previous lecture, we discussed the recall process and recognition process. Recall process where generation of memory was there. Recognition, the matching of information is there. Both these processes are distinct from each other but both these processes may share the similar underlying neural mechanism. And both these processes are under one hood that is retrieval.

So retrieval can be of several types. One is the act of recalling the information and one is the act of recognizing the information. So, when we talk about retrieval, it is important for us as a memory researcher to distinguish and understand that retrieval is very different from remembering of information. Remembering of information occurs to situation when we retrieve personal memories of the event. What does this mean?

Which means that when we are encoding and storing information, then there are different types of information we are encoding and storing for the retrieval. But this information which we are encoding and storing could be personal in nature or non-personal in nature. Personal in nature related to our personal memories or events such as autobiographical memory and some information which is not personal in nature such as the information stored at office workplace setting, information stored at school setting, information stored in a classroom which has indirect relationship with our personal life. So, remembering where we are retrieving the information related to our personal life or personal events. Then another process in retrieving memories is the knowing, knowing of information.

So what does knowing refers? Knowing refers to the retrieval of information that we have learned and may or may not be retrieved with memories of event also. So, I am aware of the information, I have learned that information, but it may require retrieval, it may not require retrieval also. So, here we understand that retrieval can be of recalling or recognition Retrieval could be retrieval of personal information is known as remembering and retrieval of could happen or could not happen but knowing is something which relates to that whatever we have learned we are collecting it and it is not so much dependent on the retrieval of information.

It is very important for us to understand that the encoding system and a storage system, both these systems require our sensory system. So, for encoding of information, we need sensory system, our sensation. For the storage also, we require a sensory system like olfactory, tactile, visual, auditory. But when the information has been encoded, when the information has been stored, then the retrieval does not depend on the sensory system. Which means retrieval becomes independent of the sensory system.

And the last point is encoding and storing seems to be meaningless without retrieval. So that is why what is the significance and what is the relevance of retrieval? Significance and relevance of retrieval processes is that whatever you have encoded, whatever you have stored, it has to be retrieved. Now, based on your action, based on your intention, based on your goal, based on your task, retrieval may vary. So, When we talk about the retrieval of information, one thing has to be clear that like we have talked about, retrieval cannot happen without encoding. Without encoding, one cannot do retrieval.

And that is why on your screen, you could see the chain of reaction where the encoding is happening and this encoded information from the sensory register, whatever you pay attention to moves to your encoding system. And from your encoding system, whatever information you have encoded moves down to storage. And once the information has been stored as per the hypothesis of consolidation, the information gets stored for a long time, for indefinite period of time, long term storage, we retrieve the information. Now, when we are talking about the retrieval per se, then we have to understand that encoding and storage are crucial for the retrieval. If encoding has been done, but somehow your storage has been affected, interfered, then the information will not go to storage level.

So encoding process is If it is getting interfered, post interference. This is a post interference. This is a post interference. If we are doing interference right here, this is pre-interference. If we do pre-interference, encoding will not happen.

If we do post-interference, storage will not happen. And once the storage is being interfered, then because the storage is not there, retrieval will also not be there. So, if the interference is not there at all, if this is intact, then the retrieval is possible, information is there in our system. So, one thing what we talk about, merger of two events may support the retrieval. Merger of two events is encoding and the storage.

Okay. So, moving further. Retrieval occurs in implicit and explicit mode. Indirect mode and direct mode. This is not very different from the two types of long term memory.

There are two types of long term memory. Implicit memory and explicit memory. And we know and we are going to learn also when we talk about the explicit memory, we talk about the episodic memory and semantic memory. And implicit memory, associative memory, habituation, sensitization, priming, all these are part of indirect memory. Indirect memory involves the consciousness and controllable.

However, direct memory Retrieval becomes automatic and subliminal. Subliminal, which means that we are not being able to observe it, perceive it. It is so quick, so rapid, so automatic in nature. So retrieval can be of two different types. Now retrieval also depends on the nature of memory.

What type of memory we are talking about? In previous lecture, when we were discussing about the neuropsychology of memory, we discussed about different brain regions involved in memory processes. Different brain regions are involved in memory, so the nature of memories are also different. Some may be motor memory, some may be emotional memory, some may be semantic memory, some may be episodic memory, some may be associative memory. So, there are different types of memory and the nature of memory depends upon n number of parameters.

As the nature of memory is there, retrieval is also going to be dependent on it. If there is a threatening information, threat memory is there, then the retrieval may be easier because

generally it is a primitive structure which gives us fight or flight responses. and detect threat in the environment. It is evolutionary in nature. The information which is not threatening in nature, the retrieval may be little challenging to retrieve because that is not the priority, that is not going to be preferred over the other types of memory. So, as per the nature of memory, retrieval also depends. Literature has talked about that emotional memory has some preferences, so the retrieval is easier.

Another important question as a memory researcher, we should be talking, addressing, is that does retrieval suggest the amount of information stored? What does this mean? The list of items you have encoded, let's say 100 words, 100 words you have encoded and stored. But at the time of retrieval, will all these 100 words will be retrieved that is a big question so the retrieval can it be an indicator the amount of information one has stored till date it hasn't been that indicator definitely based on the controlled experiment researchers have tried to highlight that yes retrieval can suggest the amount of information is stored. However, the replication and standardization of such experiments have been always been compromised in different contexts.

Another thing we should be asking to ourselves, how much information is available in our system? As I said, 100 word list one has encoded and 100 word list an individual has stored. But at the time of retrieval, all these 100 list of words is available to us? Big question. And a critical question, which we do not have an answer to it today.

Another question, how much information is accessible? From childhood, we have been storing, we have been encoding and storing information. But all those information is accessible to us? That is another interesting line of research and question where we have very less understanding and researchers are making an attempt and effort to understand and get deeper insight about this thing. Whatever you have stored is available at the time of need or not and whatever you have stored is accessible or not.

These things give us an understanding that how much information one has stored, what is the nature of retrieval, what is the nature of memory. Now, another point of discussion in retrieval is the feeling of knowing. When we talk about the retrieval, we have to ask

ourselves and we do, do I know this information? And many a time people say, I do have a feeling of knowing this aspect. But I am not able to recollect.

I am not able to recall. I am not able to recognize. Many a time, tip of the tongue is a common phenomenon we have also discussed earlier. That some movies you might have seen a decade back or maybe two decades back. And then some scene of that movie is being shown to you.

Then you are having a tip of the tongue phenomena which says that you know that thing, you have a feeling of knowing that thing, but yes, you are unable to recall it. Now, so when we talk about the feeling of knowing, the simple attempt is to make quick estimate of whether we would be able to recognize something. So if you remember, we were talking about the retrieval are of two types, recall and recognition. Feeling of knowing says that are you able to recognize without conducting retrieval? This is known as feeling of knowing.

Do you recognize the apple? Do you recognize the orange? Do you recognize the marigold flower? All these aspects Without involving the retrieval. So feeling of knowing is a metacognitive in nature.

If you remember and that is why we were talking tip of the tongue phenomena. Metacognition. It is there in your cognitive system. The only thing is that can you access it? Can you reach to that information?

So, feeling of knowing paradigm individual has come up and in this paradigm very simple thing researcher do, they just simply ask a question. They simply ask a question to judge whether they could recognize and then attempt the recognition and this is what we call it as retrieval, judgment, recognition phenomena. So, what they have to do, they just have to judge the information and how it can be done is that you just ask a question, the 19th year of India. If you know the answer, then it stops. If you do not know the answer, then the experiment continues and then we keep on asking associated and related question to the participants. So, the Nightingale of India is Sarojini Naidu.

And once the question has been answered, so session ends. And if the answer is incorrect, then option is provided. The Nightingale of India, Lata Mangeshkar. Nightingale of India, Sarojini Naidu. Nightingale of India, Indira Gandhi.

Then the individual has to opt the answer and then has to explain it. Why? So such is the feeling of knowing. And this paradigm is extensively being used in the discipline of feeling of knowing or the retrieval of information. This feeling of knowing judgment, is it automatic in nature?

As we discussed earlier that it is metacognitive in nature. So can we say that it is automatic in nature? To address this question, to understand this question, Two types of processes researchers have reported. Rader in 1987 reported that there is a strategy search which a user perform in order to have a judgment of feeling of knowing judgment. So feeling of knowing judgment to execute participants perform a strategy search.

And to look into this information or to continue thinking in this direction. So an individual look into that information more and more and more. So if I say Satyagraha. Satyagraha movement. Now this Satyagraha movement comes from the historical side.

So history, one has to know about the Indian history. But not any Indian history because then the ancient history is there, medieval history is there and then the modern history is there. So, Satyagraha movement is from modern Indian history just before the independence. So what is this movement? The significance of this movement?

So what it is? The participant is trying to continue thinking in this direction. Look into this specific information. That is the strategy search. The user or the participant come up with a certain strategy.

Then another point comes, retrieval information. If there is no chance of finding the answer, then the participants feel it is better to leave it. It is better to leave it. It's total waste of time. And then why?

So the question arises why the participant either perform the strategy search or either just give up the task. The reason being as a human brain tries to optimize the solution. tries to optimize the cognitive processes. And when we are talking about that feeling of knowing

is a metacognitive, then metacognition ensures the progress monitoring. Metacognition ensures that there should be some achievement. If those achievements are not met, then metacognition says it is better to stop the search, it is better not to find the answer because the process or the information is not available to the system and an alternative route or pathway can be adopted to find solution towards the existing problem.

Now, the ability to make the accurate feeling of knowing judgment appears to reside in the frontal cortex. Now, it should not be surprising to us because decision making, judgment, problem solving, everything is being governed by the central executive system. And this central executive system is nothing but it is a frontal cortex system. So, if a judgment has to be provided and particularly accurate judgment has to be provided, And in previous class, we have also studied that metacognition is being governed by the frontal cortex. So it should not be surprising for us to relate that the accurate feeling of knowing judgment appears to reside in the frontal cortex.

So any dysfunctioning happening at the frontal cortex will compromise your feeling of knowing judgment. As a result, your strategy search will be affected. As a result, retrieval of information will be affected. As a result, the metacognition will be affected. So, any disorder, any neurological disease which is happening or which is impairing or affecting your frontal cortex will affect your feeling of knowingness.

So, the individuals who are having Korsakoff syndrome, which earlier class also we studied that it is happening due to hyperchronic alcoholism condition. An individual is drinking a lot of alcohol. In these individuals, feeling of knowing judgment is not accurate. Why it is not accurate? Because Korsakoff syndrome affects the frontal cortex, targets the frontal cortex.

So, such important point has to be there. So, if we summarize the whole lecture, what we studied today is the retrieval process. Why retrieval process is important? If you are doing the encoding, if you are doing the storage, then it is important for the retrieval to happen. Otherwise, it is very, it is meaningless that encoding and storage is there, if you are not retrieving the information.

We also understood that retrieval of information, remembering of information is associated with personal information and this retrieval of information can be recall or recognition. More than this, feeling of knowing, I am aware of the information, cognition of cognition, metacognition. And Extending this discussion further, we also understood about the feeling of knowing judgment. Feeling of knowing judgment is an important element. People perform the strategy search.

People even perform the retrieval information. Based on the nature of information, feeling of knowing may also vary. Based on the nature of memory, retrieval of information may vary. Accordingly, feeling of knowing judgment resides in the frontal cortex and if frontal cortex is being damaged then the feeling of knowing judgment will also be affected or hampered. So let us end this session here.

In next class, we are going to understand the retrieval process, biological underlying neural mechanism of retrieval, consolidation and reconsolidation theory in the line of retrieval process. Thank you.