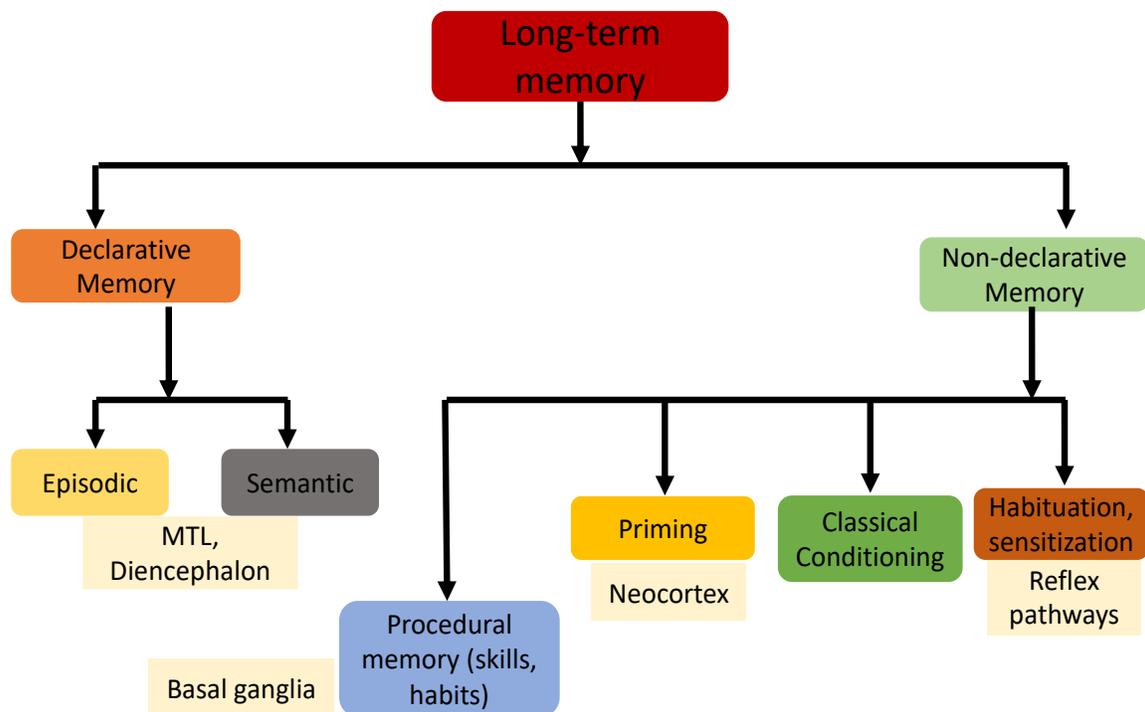


Memory
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Lecture - 20
Episodic and Semantic Memory

Hello, I welcome you all in the lecture series of memory. Today we are going to start a new topic that is episodic and semantic memory. Before we proceed to discuss about the episodic and semantic memory, we have to understand under which category of memory processing it falls under. So this is the episodic and semantic memory belongs to the category of long term memory. But as we studied earlier, let me walk you through the process.



So once the long-term storage is there, which is active in nature, after consolidation, it becomes inactive, which we discussed in the previous class. This inactive memory upon reactivation and retrieval become labile again, soft again and at this moment the stored memory you can modify it with some new information and this memory is known as long term memory retrieval. So the idea of memory distribution, what you are seeing on your screen, the long-term memory distribution incorporates this reactivated memory and also

long-term memory retrieval storage. So why is it important for us to understand this thing? As we discussed earlier, long-term memory are of various types.

So long-term memory here, one is the implicit long-term memory. or direct long-term memory or declarative memory. Then another type of memory is the implicit memory, non-declarative memory or indirect memory. This declarative memory, which we are calling it as explicit memory or the direct memory, it is of two types. First type is the episodic memory and then another type is the semantic memory, which we are going to address it in detail.

The brain regions responsible for these two types of memory is the medial temporal lobe and diencephalon. Now, these two neural structures are contributing a lot in the formation of personal information and formation of factual information in a long-term memory consolidated experiences. While the non-declarative memory if you talk about it is being divided into four different types. First is the habituation and sensitization which is our reflex responses and generally these reflex responses are following the reflex pathway. The other type of memory is the classical conditioning.

The classical conditioning generally being covered by the frontal cortex and this frontal cortex we have studied could be of different types such as DLPFC, VMPFC and MPFC. Now the priming, priming is also being governed by the neocortex but neocortex is not only the frontal cortex, neocortex is also comprised of the parietal cortex. motor cortex, etc. So, this is also indirect or implicit memory. Along with priming, there is last type is there procedural memory which involves the skills and habits.

This is in the basal ganglia. Now knowing this thing, only we will be paying more attention towards the declarative memory and this section we are going to address in this lecture. Now taking this thing in detail, the point is the type of long term memory. So types of long term memory as I was telling you about, implicit and explicit is there. We are going to target only the explicit long-term memory.

And in this explicit long-term memory, two components are there, which is episodic memory, semantic memory. The great psychologist Endel Tulving focused on two aspects of this memory. His foundational research, his extensive research in memory area, gave us a lot of insight about the nature of episodic memory and semantic memory. and we have enough evidences till date which provide us and give us a deeper insight about the two distinct types of memories that is episodic and semantic their distinct neural architecture neural pathway and also their unique characteristics in an individual's life so when we are

talking about these two aspects of memory the first type is episodic memory the word is arising from the episode And this is dealing referring to the memories of personal events.

So, personal events or personal episodes of an individual's life. This can also be referred as autobiographical memory of an individual. But not all autobiographical memory can be episodic memory. But all episodic memory can be autobiographical memory. This we will be studying it in detail further.

Another type of memory which an individual is holding, which is very direct in nature, that is knowledge of the world. The facts, the figures, how many states are there in India? How many rivers are there in Uttar Pradesh? How many mountains are there in India? How many chief ministers are there in India?

What is the national animal, national bird of India? These are some facts and figures. which has some meaningful information which an individual do not require which is not so personal to the individual but it helps an individual to uh in the future preference in the future task in the future action such information provide lot of insight to the individual So when we talk about an individual long-term memory, so individual long-term memory can be seen as two bubbles connected together. And these two bubbles, if you are talking about it, one is the episodic memory, another bubble is the semantic memory.

An individual is ensuring that his long-term memory should be efficiently and effectively providing an assistance for the episodic and semantic memory. Now, the episodic memory and semantic memory differ in the content as I was mentioning earlier. When we are talking about the personal information, when we are talking about your graduation day, when we are talking about your anniversary date, when we are talking about the day when you became father, of the day when you became brother or the day when your sister gave birth to your nephew, all those events are personal to you and that personal event are personal episode to an individual and that is why this is a part of episodic memory and the content in this are most personal in nature. The other content of the memory we are talking about is holding the facts and figure and factual information.

This is about the semantic memory. Now, Tulving asserted these two types of different memories and suggested and recommended that the episodic and semantic memory systems are distinct from each other. They hold different type of neurocognitive systems and they are very distinct from each other. One holds information which is very personal to an individual and another holds information about the world or knowledge about the world. So, if we study in detail about the semantic memory, what it is?

So, semantic memory is nothing but it is a cognitive, neurocognitive memory system. which encodes, stores and retrieves information concerning knowledge of the world. This information is meaningful to an individual to execute the day-to-day task. The content of the semantic memory as we discussed is having some facts, figures, associations that we make to learn about our world. Semantic memory is not personal in nature.

So it is unlike the episodic memory. It is unique in its own form. So here when we were discussing about the Henry Molaison case, we were discussing about the episodic memory and semantic memory. What we found in Henry Molaison case, though the medial temporal lobe was being removed, still he was having episodic memories and also semantic memory. But the capacity, the limitation was there.

So the semantic memory was very limited in Henry Molaison case. In HM, the semantic memory and episodic memory both were limited. He was having more episodic memories, more information about his personal life than the information, knowledge about the world. Because the time when the surgery happened, till that day he was having enough information and post-surgery also, few years. But after that, the moment the adjacent areas about the connected areas of the medial temporal lobe as it started to shrink, he lost the ability to form new information.

So, we may not remember how distinct it is from the episodic memory in episodic memory also we are doing the encoding storing and retrieval but there it is very important when the event has occurred when the episode has occurred and where the episode has occurred the day when you completed your schooling when and where it was different than the day you graduated then the day when you post graduated then the day when you received your postdoctoral degree okay it may happen that all the three degrees you have received it at one place however generally it doesn't happen that same way so when and where information about the episode changes every time now when we talk about the semantic memory as we are saying that it is uh impersonal It generally refers to the present purpose. It doesn't refer to the past information.

Unlike the episodic memory. Where when and where the event has occurred. When and where this situation has arised. When and where this episode has occurred. So that is talking about the past information.

But the semantic memory is talking about the present. Many a time we also update the information. where the debate is going to happen when is the election held in 2014 when did the parliamentary election held in 2014 those details are factual and may require some

current update these two types of memory semantic and episodic memory is very distinct from the working memory as we discussed earlier here the information which is present to the individual is unique in nature and the individual can only access these two information only if the information has been encoded and is stored. Because we are talking about the long term memory type.

Long term memory will only exist if the encoding has been done and the storage has been done. It may happen that the retrieval may have happened several times or one time. So, if we talk about the semantic memory, we may talk about Sherlock Holmes who has played the role of Sherlock Holmes. So, we say that Benedict Cumberbatch has played the role of Sherlock Holmes. Now, this is the fact and figure, but when it comes down to the event like pandemic, COVID-19 in 2019, then we talk about the episode of it.

Because we may have acquired the COVID-19 virus or our dear ones might have acquired the COVID-19 virus. We may have acquired the COVID-19 virus and we recovered it. When did we and how our dear ones, you know, we lost our dear ones that episode. So it brings a lot of personal information about such event, such episode. The same event can be related to the event when you completed your schooling, the day when you got farewell from your school, the day you got farewell from your college, the day you entered into doctoral degree, the day you completed your doctoral degree.

or the day you started working in a corporate sector and many more such personal events. So, like semantic memory, it is also a neurocognitive memory system which encodes, stores and retrieves information. What type of encoding and storing and retrieval is happening here? About the personal individual experiences. Episodic memory is the system responsible for encoding what, when and where the event has occurred.

In the semantic memory, when and where is not that much important. But for episodic memory, what, when, where is very crucial because this is holding the personal information about the episode, about the event when it has occurred in an individual's life. The memory pertains to the past rather than to the present. Unlike the semantic memory where we are talking about the present information. Then another aspect of episodic memory is the feeling of remembering rather than knowing.

Now these two aspects are very much important here because remembering, so when any personal event, when any personal information is there, we try to remember. we try to recollect the information about our personal event rather than knowing the facts and figures. So, remembrance can be more inclined towards the episodic memory rather than

knowing, knowing about the facts, figures, knowing that you have been, you have graduated from city Lucknow, knowing that you have post-graduated from University of Allahabad. So, such aspects we will be addressing in detail in the coming lecture. Then, flashbulb memories.

Flashbulb memories can also be referred as the episodic memory because it holds some personal information. So, if we talk about the flashbulb memory, we can talk about several incidents which has occurred in an individual's life. Like the incident which happened, the Taj Hotel incident, 26-11 or 1993 bomb blast. Many more such events are there where you might have been young and you registered such information in your system and that system holds some personal information to you. where you remember the details about the memories.

Emotion plays a crucial role in the episodic memory. If you hold an emotional value to an information, then those information may make those events and episodes more valuable and more memorable in nature. And that is why it is personal in nature. So, if three individuals were present at the same time, at the same place, but all the three individuals are going to register, encode and store the information in different way because their emotional value may vary. It is unlikely that all the three individuals are going to have the same emotional value to register the information.

So the encoding and storage will vary. If the encoding and storage will vary because based on the emotional value, then the retrieval of the information will also vary. So when COVID-19 came, then some of the individual lost their dear ones. So their encoding, their storage was different from the one who the neighbors who witnessed losing their dear ones. Witnessing the information can also have emotional value, but the intensity of emotion cannot be that high as in the other case.

As a result, the episodes are there, the events are there, episodic memory is also being formed, but the threshold of episodic memory will be different in different individual. Okay, so as I was telling you about the autobiographical memory, These are also personal in nature. We can have our own lives as an event and we register these information. An important concern here is that if I tell you the day you completed your 10th standard, what was your experience?

How did you felt the day you completed 10th standard? You hold emotional value. In national level examination, you scored good marks. You got good grades. Everybody was appreciating you.

You recollect this information. You remember this information. You remember where and when it has happened. But when? But taking this further, and I ask you, how did you celebrate at that event?

And who else celebrated their 10th standard qualification? Then that becomes the semantic memory. You do remember people were celebrating the event, but you do not remember when and where and what in detail format. You do have an understanding about the information that yes, along with you, many other people cleared the 10th standard examination. But how did they celebrate it?

When did they celebrate it? That information is not with you. So that is all is a semantic memories which hold. And that is why this type of information, autobiographical semantic information is also part of autobiographical memory. And that is why the autobiographical memory is a combination of your personal memory and also the self-referential semantic memory.

Here the self-reference is, you have cleared the 10th standard, you went for the celebration. Similarly, many other students also cleared the 10th standard and they went for the celebration. With reference to you, the others, how they celebrated, nearby, what, that holds the semantic information. Now, when we talk about such aspects, this is very clear that okay, there are some personal information, some personal references there. So, talking about this aspect, we know that the episodic memory, all type of episodic memory is belonging to the category of autobiographical memory.

But the autobiographical memory about a person's life entire cannot be part of episodic memory. Because some of those content can be semantic in nature rather than only episodic in nature. Now, it includes both events from our lives, both events from our life. And when we talk about both events from our life, then the facts and figures and personal information, both. All episodes are autobiographical but not autobiographical memories are episodic in nature.

Okay. Let us see the distinction between the two types of memory. When we talk about the two types of memory, locked up memory, the semantic memory and the episodic memory. Remembering about the apple farm. We went with our friends.

We had a very good time. We plucked several apples. We ate several apples and we brought several apples. When was this event? how many students went what was the day all these things become very personal to you and you hold the information into your episodic

memory but when we talk about the meaning in meaning of the event what was the farm the farm is uh the apple farm the apple which can be edible which is juicy pulpy red in color could be in green could be in yellow

But we encountered, read all those details. So, when we are talking about the episodic and semantic memory, type of information is stored. Episode holds the personally experienced event. Personal information, which you have experienced it. Here, the general fact or impersonal information.

The information which is not personal at all to you. Unit of information, events or episodes. While for the semantic memory, we talk about the facts, ideas, concepts. When we talk about the mental experience, Tulving proposed this episodic memory as mental time travel. We are doing a time travel.

Where are we travelling? We are traveling back in time to remember our childhood, to collect our childhood memories, to collect our memories from the school time, to collect our memories from college time, to collect our memories when we got married, to collect our time when we got the scholarship or major events which hold some emotional and personal value to us. While here, we are talking only about the knowledge of the facts. So, the mental time travel is taking you back in time, giving you an opportunity to collect the information wherever at time point you want to collect. While the semantic memory is only talking about the knowledge of the facts and knowing.

Neural regions if we talk about here, the frontal lobe as we have been discussing about it, the frontal lobe, right prefrontal cortex and semantic memory is for the left prefrontal cortex. Now why? Right brain, right hemisphere, we consider it as an emotional brain. Well, the left side of the brain is more logical brain, more reasoning, Decision making, problem solving is being governed, is being handled by the left hemisphere.

Now, definitely central executive system is there from the frontal side. So, left prefrontal cortex is playing major role in the semantic information. But the episode is more personal to us, holds an emotional value. And right hemisphere is emotional brain. So the right prefrontal cortex take a lead in this direction and reflect upon the dominance in the episodic memory.

Now when we see this episodic memory by right prefrontal cortex, semantic memory by left prefrontal cortex, we affirm, we understand the double dissociation between the two. One cognitive system, one cognitive processing is happening in right prefrontal cortex

while the other cognitive processing is happening in the other side of the brain showing the double dissociation. Neural regions in the temporal cortex, we saw that in Henry Molaison case when medial temporal lobe was being removed, the individual was not able to form new memories, new information. While the previous information, he was able to retrieve and recollect.

Characteristics	Episodic Memory	Semantic Memory
Type of information stored	Personally experienced events	General facts
Unit of information	Events or episodes	Facts, ideas, concepts
Mental experience	“Mental time travel”/ remembering	“Knowledge of facts”/ knowing
Neural regions (frontal lobe)	Right prefrontal	Left prefrontal
Neural regions (temporal lobe)	Medial temporal lobe	Medial temporal lobes

Now you may ask me a question, how is it possible when medial temporal lobe is not there, then how an individual is able to recall the episodic memory is intact. The episodic memory was intact because the old memory become independent of a structure. So, at the time when the surgery was conducted, the medial temporal lobe was being removed, the new information is dependent on it. But the old information before the surgery, they became independent of the structure. Here also, when we talk about the semantic memory, we saw the medial temporal lobe plays a major role.

Now, one interesting fact here is that medial temporal lobe is present on left and right. Which is showing dominance for which type of memory? That is inconclusive. But we are very clear about it that for both types of memory, medial temporal lobe shows an activation. In addition to this, there is parietal lobe also, which is playing a role.

But in the medial temporal lobe, there is an important part. The behavioral evidence. behavioral evidence provided by Endel Tulving in 1985. What he talks about, he talks

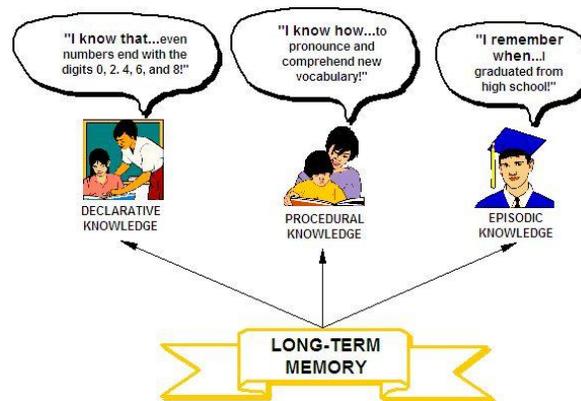
about what we know and what we remember. Remembering is retrieving the personal context.

Knowing is information was accessible in memory. Now, if I have to associate the remembrance, I will associate with the episodic memory and knowing I can associate with the semantic memory. Remember judgment are more likely than the no judgment to be accompanied by the contextual details. Why so? Because when we talk about the remembrance, we try to retrieve the information which we have encoded and stored in our long-term memory.

The same thing encoding and storage is being performed With the previous information, but do I know the information? Am I knowing the information? That is also dependent on the long-term memory. Now, if you see on this cartoon, it says that direct memory, I know that even numbers end with the digit.

Which digit? 0, 2, 4, 6, 8. Even numbers, multiples of 2. I know how to pronounce and comprehend new vocabulary. That is a procedural memory, which is a part of, by the way, is a part of non-declarative memory, implicit memory.

So, declarative memory is direct and this procedural memory is non-direct. and when we are talking about the episode i remember when i graduated from the high school so there is an event which an individual has remembered and this is a personal experience so remember judgments are more likely than the no judgment to be accompanied by contextual details when there is a context provided then remember judgment seems to be easier. Why? Because context is where and we have been talking about that in the episodic memory, we address about the what, when and where.



Source: <http://fity.club/lists/suggestions/procedural-memory/>

So, when we are talking about the contextual details, when the context has been brought into the information processing, then it becomes little easier and little biased towards the episodic event. And that is how the remembrance is becoming better. No judgment occurs equally for meaning based learning for visual characteristics. So let's say a list of words are there and these lists of words are having different colors. Now the list of words which has been provided to you if during the test time you have been flashed a target word and asked

Do you remember this word? Then what do you remember? You try to see the word and try to remember if this word existed in the list which has been shown to you previously. Do you know this word? That involves some meaning to it, some additional information.

As a result, what we have seen, remember judgment seems to have more likelihood to happen than the no judgment. But when the nature of the no information is changing and changing to visual characteristics, then it seems that remember judgment seems to slow down and no judgment becomes better. Remember judgment are much more common for meaning based happening for visual based learning. Remember and no judgment do not differ in memory strength. In memory strength they do not differ.

However, based on the context, it may vary. So, let us summarize what we have studied in this lecture. The types of long-term memory. What are the types of long-term memory? We discussed about there is a direct memory and then there is a indirect memory.

This we are calling it as implicit memory. And this we are calling it as explicit. Now, this was having four different types, procedural, priming, habituation and sensitization and associative learning. When we are talking about the explicit here, then we are talking about the two things, personal information, episodic and then the semantic information, which holds the meaningful information. While talking about this thing, we also said that we will be paying attention only to this section.

Semantic memory holds the meaningful information, facts, figure, and that holds also the present information. Episodic memory holds the past information, gives you an information about the specific episode. All episodic memory can be part of autobiographical memory, but all autobiographical memory cannot be episodic memory. Autobiographical memory talks about the personal event along with self-referential semantic memory. And finally, we also study the difference between the episodic memory and semantic memory.

When semantic memory is talking about the personal information processing, semantic memory is talking about the non-personal information processing. When episodic memory

is talking about the encoding, storage, retrieval. Retrieval of personal event. Semantic memory is talking about the encoding, storage and retrieval of facts and figures. Different brain regions are responsible.

Episodic memory holds personal information. Right prefrontal cortex is showing inactivation. Semantic memory showing left prefrontal cortex. Medial temporal lobe is there. in both the regions.

More than this we have also seen that the posterior temporal lobe is playing role in the episodic memory and the frontal temporal lobe is in the semantic memory distinction. Let us end this lecture here. In the next lecture we are going to extend our understanding about the episodic and semantic memory. Thank you.