Applied Ergonomics
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Lecture – 15

So, welcome to this lecture series of cognitive ergonomics and today we will going to discuss the very important topic for us basically because particular topic that we are going to discuss today is a memory. So, memory plays a very crucial part in our daily life activities and as well as information processing is concerned because if memory will not be there. So, you will not be able to recall the past events and based on your knowledge and experience if it is not there in order to decide a particular task. So, you will not be able to perform it in a well efficient manner.

So, in information processing especially for human being this memory plays a very important rule. So, today we are now going to discuss that particular topic.

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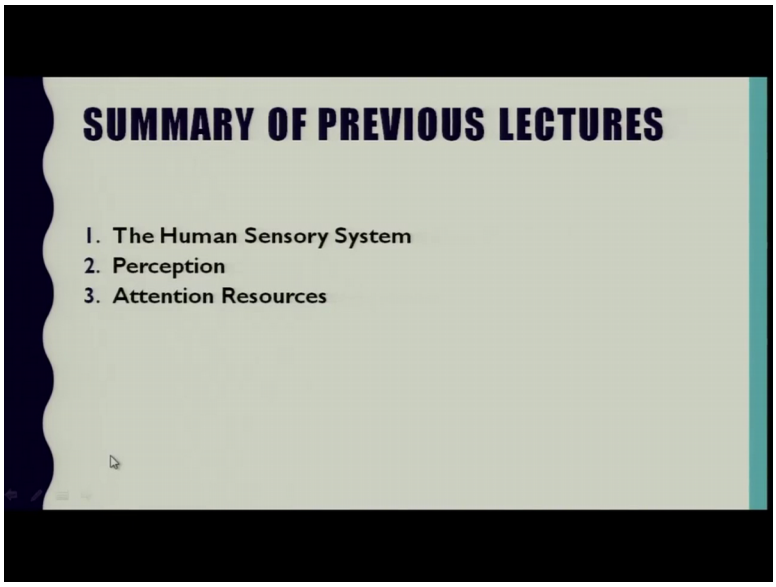

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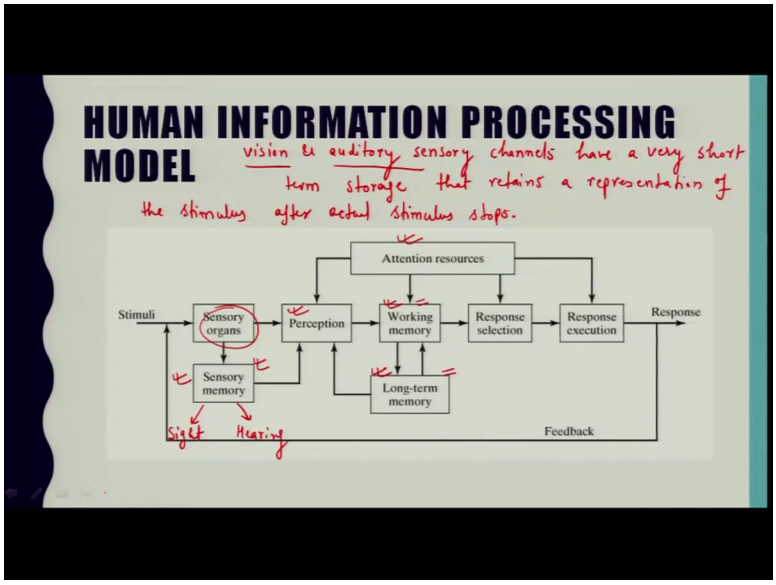

So, as for as summary of previous lecturer is concerned we have covered human sensory system, perception and attention resources. So, as you can see we are just trying to understand this human information processing model which is a building block of our whole cognitive system. So, in that we have discussed perception, we have discussed attention resources we have discussed various sensory organs as well now the next part in this human information processing model is working memory and long term memory and sensory memory.

So, these memory is a as you can see it is occupying 3 blocks in our model of human information processing system. So, that is sensory memory, working memory and long term memory. So, this sensory memory as you can see from this particular model it is associated with the human sensory channel mainly sight and hearing, the vision and auditory sensory channel each have a very short term storage that retains a representation of the stimulus, actually after the actual stimulus stops. So, the other sensory channels may also have a similar memory units as well so in order to differentiate in a much better way so the memory we are initiating here.

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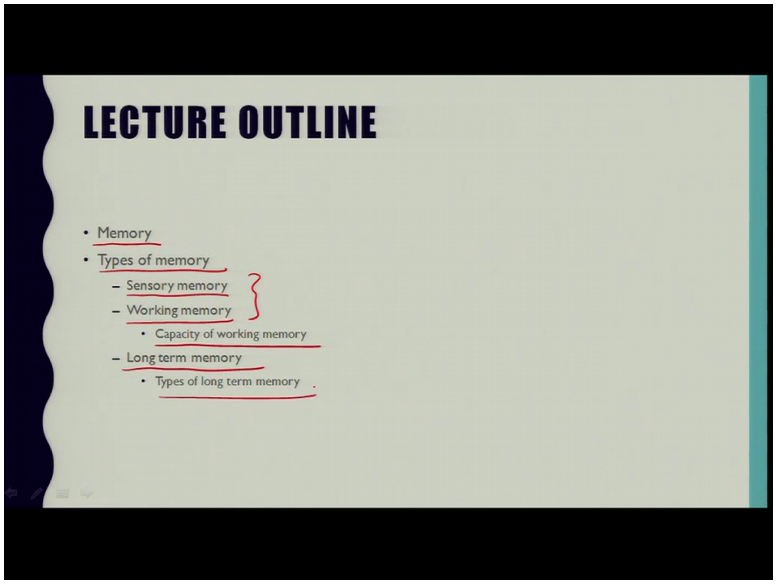

So, now before processing this let us have a outline as well. So, we will be discussing about the memory, types of memory. So, that we have this, we have shown in the human information processing model, sensory memory, working memory and that we will also discuss about the capacity of working memory and if time permits we will also discuss about the long term memory and types of long term memory.

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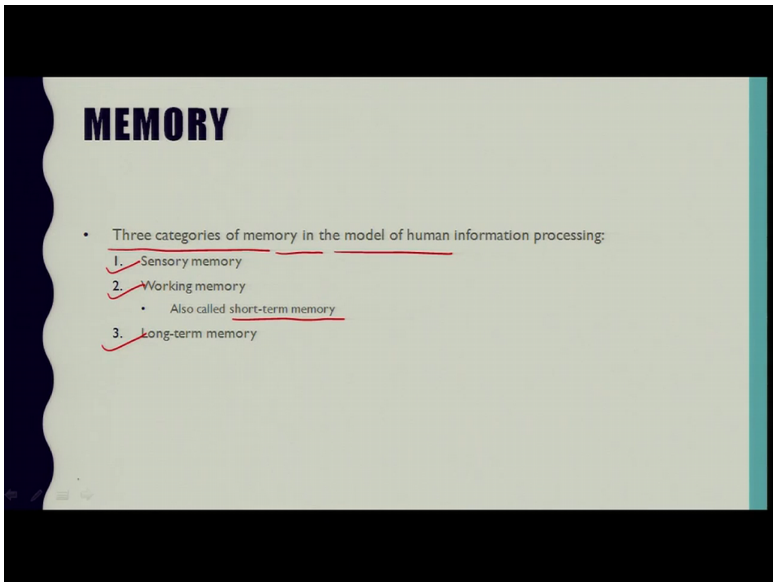

So, basically the this particular memory there are basically 3 categories of memory in the in this model, first is sensory memory, working memory which is also called short term memory and long term memory that we have seen in the our model as a first slide. So, now, we will focus on the types of memory.

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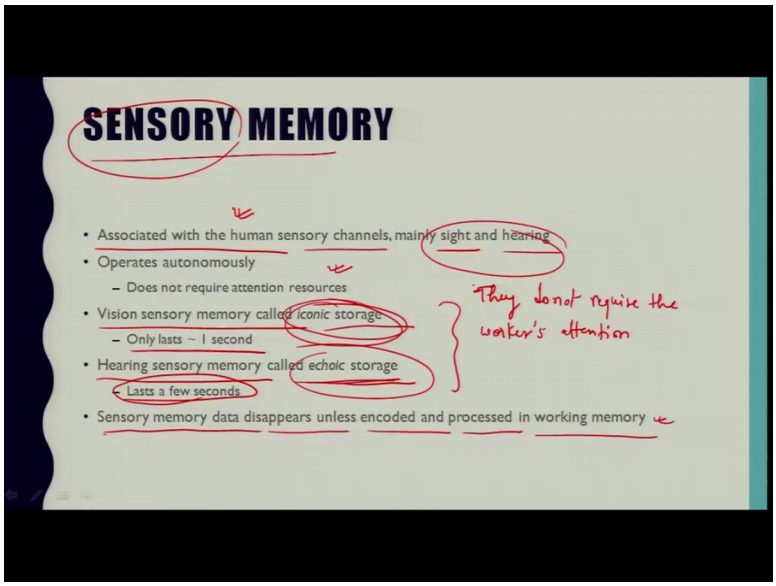

So, first kind of memory is sensory memory, this particular sensory memory is associated with human sensory channels. So, as its name is suggesting that it is sensory memory so based on the sensors that a particular human body is having. So, mainly it is sight and hearing so based on this sight and hearing whatever the memory is associated with it, it is sensory memory the vision and this auditory sensory channels have a very short term storage unit and other sensory channels may also have similar memory units as well. So, the vision sensory memory is called iconic storage and the hearing sensory memory is called echoic storage.

So, the iconic presentation basically this iconic representation in fact, last only about 1 second and the echoic storage that retains for about few seconds. So, after that sensory information or sensory memory data disappears unless it is encoded and processed into working memory which basically requires the utilization of attention resources. So, if one wants to retain in that particular domain. So, it needs knowledge of attention resources also. So, these iconic storage and echoic storage operate autonomously that do not require workers attention, we will take some examples also in order to have a better understanding of these memories. So, just for now we will understand with the help of definitions. So, another kind of memory is working memory.

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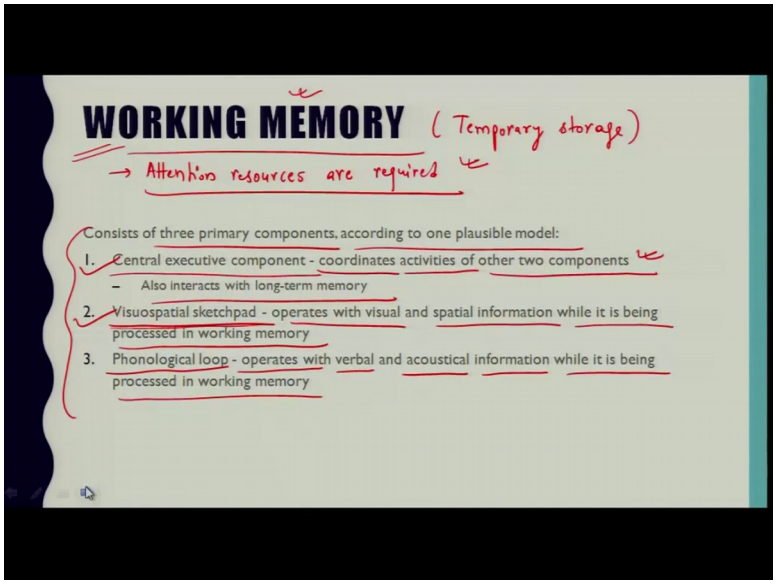

So, in that working memory it is basically it is nothing, but a temporary storage that holds a limited amount of information including information from sensory memory while it is being processed. So, it is completely a temporary storage and as far as long term memory that is the third component in the memory section of human information processing model. So, that long term memory is the warehouse for all the retain knowledge and experiences that have been accumulated over a particular person's life time.

So, we will also learn how we can memorize particular event or incident for a long term basis. So, there is a still there is a section we will discuss like which is named as a semantic memory. So, we will discuss in the next slides. So, here we were discussing about the working memory. So, this particular working memory consists of 3 primary components according to one plausible model, the first is central executive component which coordinates activities of other 2 components as information processing takes place and in fact, it also interact with the long term memory.

The second kind of component of this working memory is visuospatial sketchpad; it operates with visual and spatial information while it is being processed in working memory. The third kind of component is phonological loop, it operates with verbal and acoustical information while it is being processed in working memory. So, basically for all these components attention resources are required to keep an information item active in this particular memory. So, the point is that attention resources about the attention resources we have covered this particular topic in previous lecture.

So, attention resources are required here in order to maintain this information or keep that particular information item active. So, attention resources are required here. So, these are they have there are 3 primary component like central executive component, visuospatial sketchpad and phonological loop that comprises of working memory.

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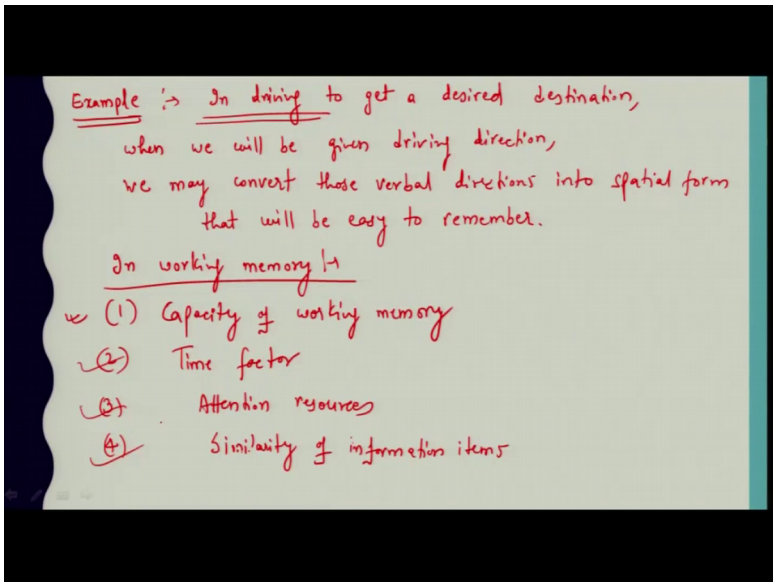

So, as an example if we can take so in order to have some resemblance with the practical situation so as an example we can take, like when given driving direction to get to a data a desire destination like when you are in driving to get a desired destination.

So, when we will be given driving direction. So, we may convert those verbal direction into a spatial form that will be convenient to remember. So, number of images, sounds and ideas that can be processed at one time in working memories very limited and length of the time that the information item can be kept in working memory is also very limited. So, in addition the amount of attention required and the similarity of the information item that can be processed archi performance factors in the operation of working memory. So, in order to understand this particular working memory there are basically 4 factors here to discuss.

The first factor is capacity of working memory, since I am giving you just the fundamental and definition of those things and you can easily correlate with the situation that you tackle on the daily basis. So, whatever the task you are performing you can relate with the, with your short term memory or working memory or long term memory.

So, here I am giving you the definition and fundamentals and now it is your duty to correlate with the, your daily life examples. So, a capacity of working memory, the second factor is time factor and third is attention resources and 4 is similarity of information items. So, one by one we will take these things and try to develop a better understanding towards this working memory.

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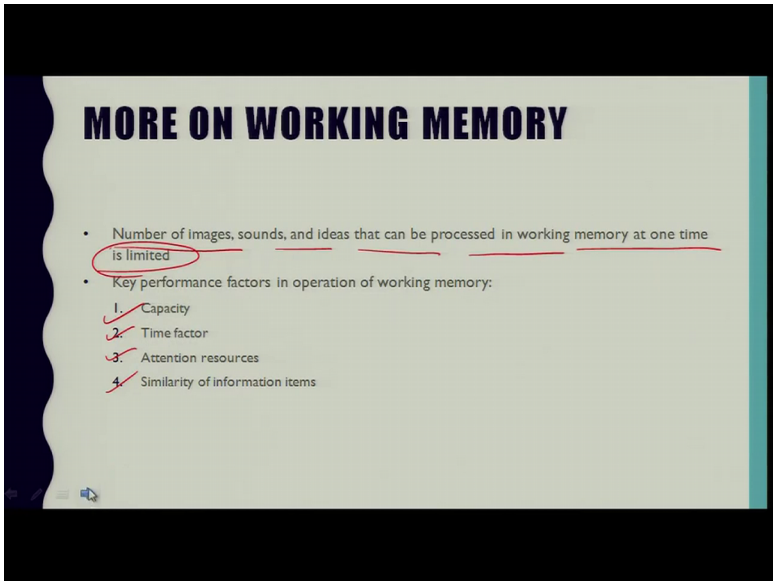

So, basically these factors we have just now discussed and number of images sounds and ideas that can be processed in working memory is at one time is very limited. So, now, we will take the capacity of working memory.

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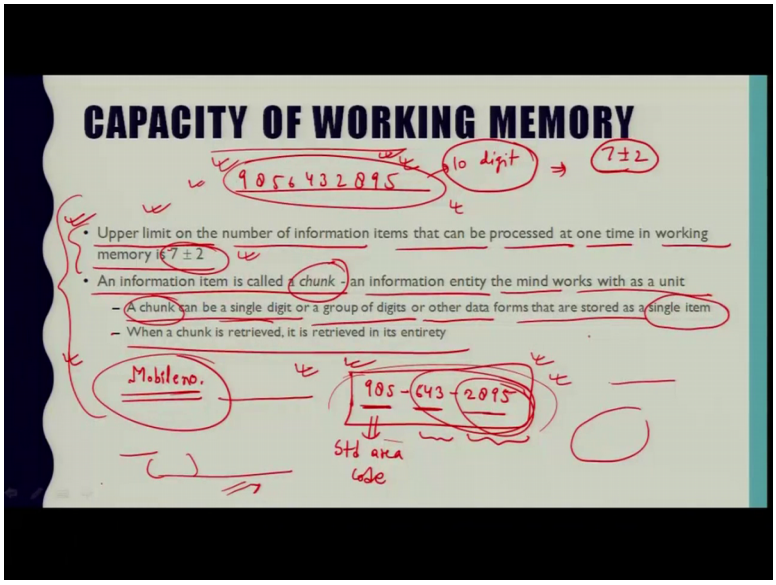

So, how much is that, since we have mentioned that the particular information which retains in our memory is very limited.

So, and there is a very limited time to which that particular information is retained in our system. So, that working memory there must be upper limit on the number of information items that can be retained so and as well as the process. So, the upper limit on the number of information items that can be processed at one time in working memory is 7 plus or minus 2. So, that and information item is called a chunk, a chunk is basically an information entity that the mind works with as a unit, the unit can be a single digit the unit or that unit is called chunk.

So, where were the information item we note we will call it as a chunk. So, the chunk can be a single digit or a group of digits or the other data forms that are stored as a single item, so single item information whether it is a single digit or multiple digit it if as a pet as a whole if you are calling as a single information. So, that particular single unit we call it as a chunk. So, when a chunk is retrieved it is retrieved in its entirety. So, as an example you can take to recall your mobile number suppose as an example if you are meeting to a stranger and your infection goes to a certain level and then you request him to give his mobile number.

So, as of now in India the mobile number is of 10 digits. So, that 10 digits how will you be able to recall it can only recalled when there is some sort of sequence or if it is random and there is no kind of sequence that your mind can obtained from that particular

10 digit number. So, it is very difficult for you to recall. So, here the case applies here the first sentence in other way you can also check this particular thing whether it is applicable in your case or not that the upper limit on the number of information items. So, is 7 plus or minus 2. So, as a whole if you are putting your 10 digit number like 9,8,5,6,4,3,2,8,9,5 so this particular 10 digit mobile number and if you want to remember it as a whole it is it may be very difficult for you to recall after certain days, but at the same time because as it is mentioned in the one particular book that particular, this particular information is taken from the from the book written by g a miller.

The magical number of 7 plus or minus 2 some limits on our capacity for processing information. So, like it has been published in a psychological review in 1956. In fact, so, he is predicted that the maximum number at a one time a particular human can recall is 7 plus or minus 2 if you are genius so you can recall otherwise for normal human being more than 7 digit at a time is very difficult to recall. So, like this is a 10 digit number and surely this remembering this number in working memory would be very difficult, at this particular number is containing 10 chunks of data which exceeds the magic number 7 plus or minus 2 this you can see here this is a 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 such that 10 chunks of data.

So, now, if the, if that number is recognized as a let us say mobile number. So, and formatted as a mobile number as like 9, 8, 5, 6, 4, 3, 2, 8, 9, 5 so number of chunks is reduced considerably and now number becomes easier to remember. So, since you have splinted the whole information in some partition some parts. So, now, you can re call that number in a bit easier way than to recall the 10 digit or 10 chunks of data as a whole. So, here if you split in this particular way so now as a mobile number if you want to re call.

So, this could be your some sort of std area code and another can be like some sort of another number that you can recall and this also with the sequence remembering you can also recall the whole digit data. So, if you are splitting that particular data and then it may be like it may be any exchange number or some sort of familiar or some sort of coding or some picturisation you have to make in your mind in order to recall that digit number. So, if a number is reduced to 4 5 or less than 7. So, you can easily recall, but it is difficult to recall in a working memory from the memory the whole 10 digit as a as a lamp. So, in this way you can recall the particular thing. So, since I have taken the example mobile number which has now being used for the near about each and every

people. So, this particular mobile number you can take an example to describe the working memories phenomena the same kind of chunking applies to letter and word sequences. So, instead of reading the individual letters in word in a word, the word becomes a chunk and when combined with other world with a long sentence shadow was taken together becomes a chunk and finally, the sentence can be interpreted because even though it make consists of more than 100 letters the reader does not read the sentence as letters, but rather as a word and collection of words that are chunked into units that can be managed within the limitation of working memory.

So, basically that is why the short sentences are easy to read and interpret and why a reader must sometimes go back to the beginning of the sentence in order to have a proper information and in order to have a link and in order to have in order to make sense of the sentence. So, in order to extract the meaning of a particular long sentence we have to go to beginning in order to understand that particular sentence. So, this is all about the information that is defined as a chunk and what is the limitation of your memory, especially working memory.

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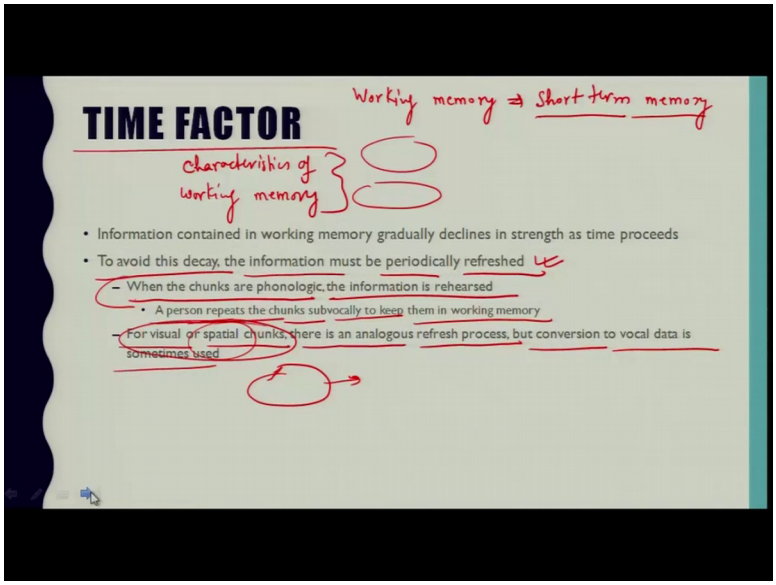

So, now the next factor in this working memory is time factor, working memory is also called short term memory. So, because the information or a chunk contained in working memory gradually the clients in its strength and slowly you forget that particular information that you have stored in your memory. So, as the time passes that information

goes on declining its strength. So, nearly everyone has have the experience of being introduced to someone and after just a few moments you again ask the name of that particular person. So, since you have forgotten that particular name which has been told by the person in front of you just before some minutes.

So, in order to avoid this decay that is the characteristics of a working memory that the information cannot retain for a longer period of time. So, in order to avoid this particular decay the information must be periodically refreshed. So, you have to ask the particular persons name in several times if it is completely new name for you in order to have a complete information of his name for a longer period of time.

So, there are various ways in order to put it in your mum mind and as well as in your memory that when the chunks are phonologic the information is rehearsed a person repeats the sequence of chunks sub vocally in order to keep them in working memory for visual and spatial chunks the refresh, there is analogous refresh process and sometimes involves the translation of visual chunks into verbal form. So, for example, if we see a telephone number in the directory, but we convert that number into its local counterpart in order to remember it. So, you have to convert that particular data in some sort of visual means or a spatial means in order to put it into your memory for a longer time.

So, this is a time factor.

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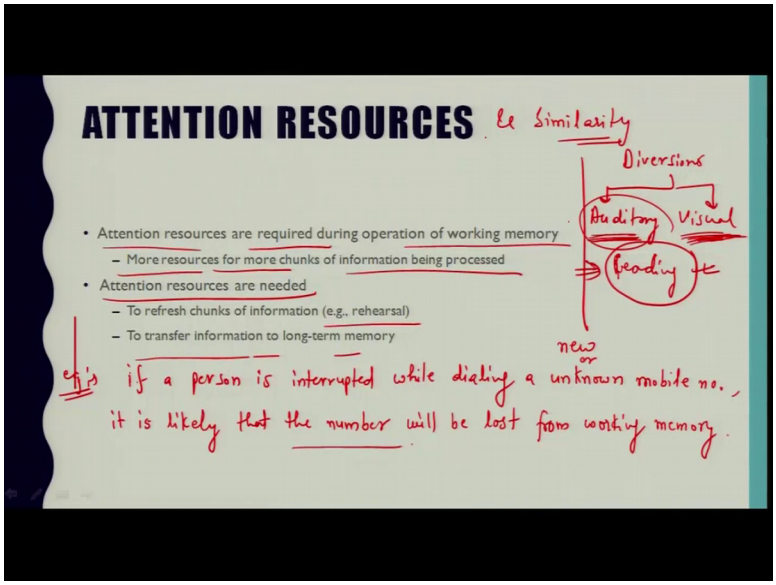

So, now we will understand about attention resources and similarities. So, attention resources are required during the operation of working memory as more chunks of information are being processed more resources are required, attention resources are needed during the refresh cycle that is rehearsal and they are needed for transfer of information to long term memory. So, if the resources are diverted the refresh cycle is interrupted and the decay of information in working memory accelerates.

For example, if a person is as an example if you can take to understand this fact that if a person is interrupted while dialing a unknown like just new unknown or new mobile number or telephone number what you say it is likely that the number will be lost from its memory its working memory or in any case if it is not lost that the person will forget which does it was completed prior to the interruption. So, this kind of diversion can be auditory or visual in our model of working memory verbal diversions are more destructive of the follow phonetic loop and visual divergence are more disruptive of visual spatial sketchpad, auditory diversions seem to be more generally deceptive.

On the operation of working memory than visual destruction, many people find music to be a significant distraction when they are trying to perform even simpler task that required working memory such as reading. So, if you are reading something. So, and some sort of music is coming to your ear. So, it will give you a significant distraction and you will not be able to focus on your reading, the similarity of the information chunks being processed effects working memory performance.

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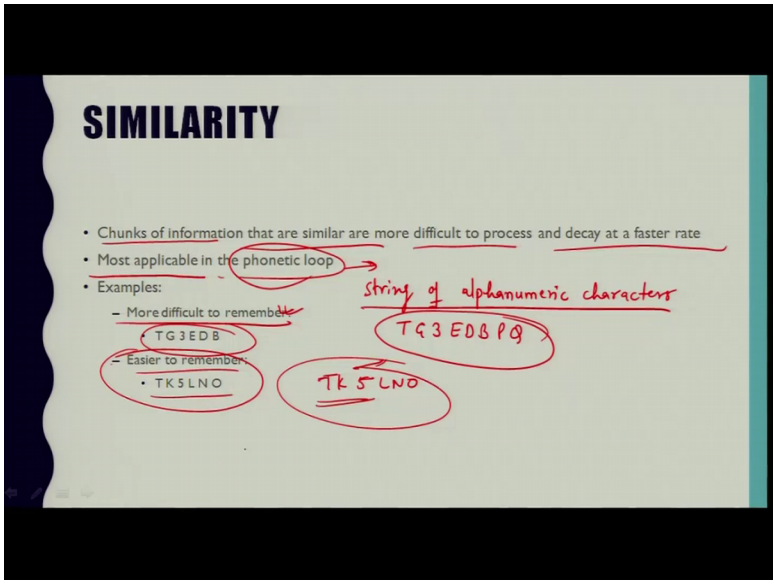

So, chunks of information that are similar are more difficult to process and decay at faster rate. So, especially when the sequence of the chunks is important, this observation scenes most applicable in phonetic loop, this phonetic loop is a what like a for example, if you can take one example of like a string of alphanumeric characters like that is more difficult to remember if you take for example, string of alpha numeric characters like this T G 3 E D B P Q. So, it is very difficult to maintain in working memory than the sequence T Q T K 5 L N O.

So, this is because the sound in the first sequence are so similar. So, some sort of resemblance and easiness you have to maintain in order to put it in your memory for a longer time. So, now, I am closing this lecture, I hope you have developed some understanding towards memory and specially working memory and some examples I have put for you in order to correlate with your day today activities. So, that you could have a feeling of what is the capacity as a normal human being and what are the possible options in order to recall that particular information.

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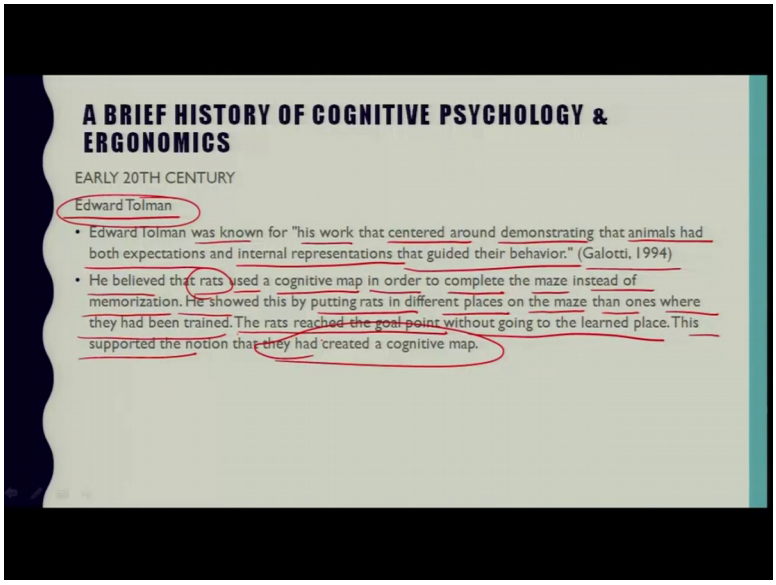

So, before closing that let us have a brief history of cognitive psychology as we are doing from past few lectures. So, just to recall Edward Tolmans work in early twentieth century he was known for his work that centered around demonstrating that animals had both expectations and internal representations and that guided their behavior. So, Galotti 1994 he mentioned the Edward Tolamn work and Edward Tolman believed that rats used a cognitive map in order to complete the maze instead of memorization. He showed this by putting rats in different places on the maze than once where they had been trained, the rats reach the goal point without going to the learn place this supported the notion that they had created a cognitive map. So, that is all for now in the next lecture we will discuss discussing about long term memory.

Thank you.