PSY 316
Human Memory

Ibadan Distance Learning Centre Series

PSY 316
Human Memory

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Vice-Chancellor's Message

I congratulate you on being part of the historic evolution of our Centre for External Studies into a Distance Learning Centre. The reinvigorated Centre, is building on a solid tradition of nearly twenty years of service to the Nigerian community in providing higher education to those who had hitherto been unable to benefit from it.

Distance Learning requires an environment in which learners themselves actively participate in constructing their own knowledge. They need to be able to access and interpret existing knowledge and in the process, become autonomous learners.

Consequently, our major goal is to provide full multi media mode of teaching/learning in which you will use not only print but also video, audio and electronic learning materials.

To this end, we have run two intensive workshops to produce a fresh batch of course materials in order to increase substantially the number of texts available to you. The authors made great efforts to include the latest information, knowledge and skills in the different disciplines and ensure that the materials are user-friendly. It is our hope that you will put them to the best use.

Professor Olufemi A. Bamiro, FNSE
Vice-Chancellor

Foreword

The University of Ibadan Distance Learning Programme has a vision of providing lifelong education for Nigerian citizens who for a variety of reasons have opted for the Distance Learning mode. In this way, it aims at democratizing education by ensuring access and equity.

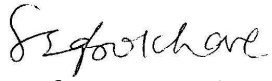
The U.I. experience in Distance Learning dates back to 1988 when the Centre for External Studies was established to cater mainly for upgrading the knowledge and skills of NCE teachers to a Bachelors degree in Education. Since then, it has gathered considerable experience in preparing and producing course materials for its Programmes. The recent expansions of the programme to cover Agriculture and the need to review the existing materials have necessitated an accelerated process of course materials production. To this end, one major workshop was held in December 2006 which have resulted in a substantial increase in the number of course materials. The writing of the courses by a team of experts and rigorous peer review has ensured the maintenance of the University's high standards. The approach is not only to emphasize cognitive knowledge but also skills and humane values which are at the core of education, even in an ICT age.

The materials have had the input of experienced editors and illustrators who have ensured that they are accurate, current and learner friendly. They are specially written with distance learners in mind, since such people can often feel isolated from the community of learners. Adequate supplementary reading materials as well as other information sources are suggested in the course materials.

The Distance Learning Centre also envisages that regular students of tertiary institutions in Nigeria who are faced with a dearth of high quality textbooks will find these books very useful. We are therefore delighted to present these new titles to both our Distance Learning students and the University's regular students. We are confident that the books will be an invaluable resource to them.

We would like to thank all our authors, reviewers and production staff for the high quality of work.

Best wishes.



Professor Francis O. Egbokhare
Director

General Introduction and Course Objectives

Human memory (PSY 316) is an introduction to types of memory, the models of memory, factors influencing what people remember and why people forget. The course further examines the biological basis of memory and how mnemonics help to improve people's to memory acuity. Specifically, the course attempts to achieve the following goals at the end:

- to explain human memory and the benefits involved in selecting information into your memory;
- to understand which factors influence what we remember;
- to explain why we forget;
- to explain the biological basis of human memory; and
- to explain how mnemonics help us to remember things better

Therefore, every lecture in this course must be effectively handled with total commitment as a student who is ready to excel in his or her academic pursuits.

LECTURE ONE

Memory as A Cognitive Process

Introduction

In this lecture, I intend to introduce to you the human memory as a cognitive process. This involves how you remember information through the process of encoding, storage and retrieval.

Objectives

At the end of this lecture, you should be able to:

1. discuss the three basic steps in remembering things; and
2. discuss the processes of encoding, storage and retrieval in remembering things

Pre-Test

1. What is encoding as a step in remembering things?
2. What is storage as a step in remembering things?

CONTENT

How do we remember?

Before you can begin to remember anything, you have to perceive it - to see it, hear it, or become aware of it through some of your senses. Your memory works through three basic steps: first, you have to get material into your memory; second, you have to hold the material; and third, you have to find it so that you can take it for use later.

1. The first step in remembering requires you to encode whatever you want to remember. Encoding is the process of getting information into the memory system. You get information ready for storage by

organizing it in some meaningful way. One way is by combining letters of the alphabet into words, combining words into sentences and combining sentences into ideas. We also encode material by sound and meaning. Encoding is most effective when it involves making meaningful associations between new material and material already in memory. Only encoded information can be remembered.

2. Second, you put the material in storage so that it stays in memory.
3. The third, crucial step in the sequence is retrieval, or getting the remembered information out of storage. The thoroughness with which you prepare information for memory and store it determines the efficiency with which you retrieve it later.

Forgetting can occur because of a problem in any of these three areas.

Memory is regarded as a topic in cognitive psychology because human beings are seen as active processors of information. We act on information, rather than passively responding to it. The two most popular explanations of the way human memory works are the storage-and-transfer model proposed by Richard Atkinson and Rischard Shiffrin (1968, 1971) and the levels-of –processing model of Fergus I. M. Craig and Robert S. Lockhart (1972).

Summary

In the lecture, effort was made to explain the three basic steps in remembering anything. These three basic steps are encoding, storage and retrieval. Forgetting can occur as a result of a problem in any of the three basic steps mentioned. The two most popular explanations of the way human memory works are stated to be storage-and-transfer model and the levels-of-processing model of human memory.

Post-Test

1. What is retrieval as a step in remembering things?
2. What are the two major models of human memory stated in this lecture?

References

Atkinson, R. C. & Shiffrin, R. M. (1968). Human Memory: A Proposed System and its Control Processes. In K. W. Spencer & J. T. Spencer (Eds.), *The Psychology of Learning and Motivation: Advances in Research and Theory (Vol. 2):* New York: Academic.

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LECTURE TWO

Models of Memory

Introduction

The lecture introduces you to the two most popular explanations of the way human memory works. These are the *storage-and-transfer model* proposed by Atkinson and Shiffrin (1968, 1971) and the *levels-of – processing model* of Craig and Lockhart (1972). Each of these two models views human memory in different perspectives.

Objectives

At the end of the lecture, you should be able to:

1. mention the two most popular models and describe how human memory works;
2. explain human memory from the perspective of storage-and-transfer model with examples; and
3. explain human memory from the perspective of levels-of–processing model with examples.

Pre-Test

1. Explain how memory works from the storage-and-transfer model
2. Mention and discuss the three types of memory, according to Atkinson and Shiffrin.

CONTENT

Models of Human Memory

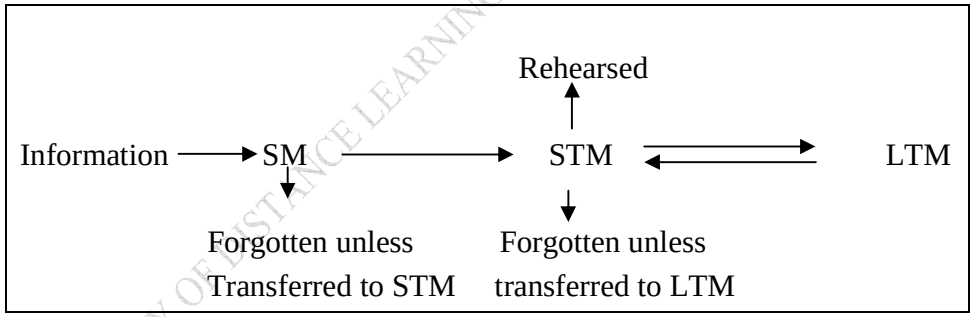
A. ***Storage-and-Transfer Model of Memory***

According to Atkinson and Shiffrin's storage-and-transfer model of memory, all of us have three types of memory. First, material comes through our senses – eyes, ears, nose, and so forth-into *sensory memory*

(SM). Depending on the particular sense involved, material lasts for from 1 second to a few seconds in sensory memory. Thereafter information either disappears or is transferred from sensory memory into *short-term memory (STM),* where it may last for approximately 20 seconds. If it does not disappear at this stage, it moves into *long-term memory (LTM),* where it may remain for the rest of your life. Since this model proposes multiple levels of storage system, it is sometimes called the multi-store model of memory.

Atkinson and Shiffrin's storage-and-transfer model of memory states that information comes through the senses and enters sensory memory. It may then enter short-term memory, where it remains for no more than a few seconds unless held longer by rehearsal. If it is not forgotten, it enters long-term memory, where it is organized and stored. When information is recalled, it is retrieved from long-term memory and moved back to short-term memory (see Table 1). It is note worthy that the capacity of short-term memory is limited, but the capacity of long-term memory is virtually limitless.

Table 1: **A Typical Form of Storage-and-Transferred Model of Memory**



Note: *SM= Short Term Memory; STM=Short Term Memory; LTM=Long Term Memory*

B. **Levels-of Processing Model of Memory**

There is another way of looking at how memory works. Some researchers (Craik & Lockhart, 1972; Craik & Tulving, 1975) disagreed with the concept of memory as a division into three separate structures. Instead, they identify only one kind of memory and proposed a levels-of-processing model of memory. This model is based on the idea that the

ability to remember is dependent on how deeply we process information. We process material along a continuum of ever-increasing depth, running it through on levels that range from quite shallow to very deep. The deeper you process material, the longer it lasts.

How does this concept work?

The shallowest level of processing, according to this model, involves your awareness of a sensory feature; that is, what a word or number looks like or sounds like; what a food smells or tastes like, and so on. As you recognize some kind of pattern in your sensory impression, you will process it more deeply. When you make an association, that is, give a meaning to your impression, you will be at the deepest level of processing the level at which you form the strongest and most enduring memory trace. In short, the levels-of processing model of memory holds that the ability to remember is dependent on how deeply you process information. For example, your ability to remember a memorized mobile phone number given to you by an old friend depends on how processed the information is in your memory.

If you had been a subject in a study that Craik and Tulving (1975) ran to test this hypothesis, you would have been asked to look at a number of different words. You would have been asked whether each word was in capital letters, whether it rhymed with a specific sound, whether it would fit into a given category, or whether it would fit into a particular sentence with a blank spot. To get a picture of the levels-of-processing for these words, see Table 2.

Table 2: **Typical Questions and Answers in a Levels-of-Processing Experiment**

Level of Processing	Depth of Processing	Questions	Answers	
			Yes	**No**
1. Structural	Shallow	Is the word in capital?	TABLE	Table
2. Phonemic (sound)	Intermediate	Does the word rhyme with *weight*?	Crate	Market
3. Category	Deep	Is the word a type of fish?	Shark	Heave
4. Sentence	Deep	Would the word fit this sentence: "He met a _____ in the street"?	Friend	n Cloud

After these questions, you would have received a surprise quiz on the words, in which you would have been asked to recall or recognize them. Recall and recognition are two different measures of memory. *Recall* is a measure of retention in which the subject has to reproduce from memory material that has been previously learned. *Recognition* is a measure in which the subject is confronted with material that has been previously learned and is asked to identify it.

In this experiment, Craik and Tulving (1975) found that deeper levels of processing generally took longer to accomplish than the shallower levels and produced stronger memories of the words. Follow-up tests suggested that it was not the time itself but the depth of processing which was important. When a complex but shallow task was assigned (such as classifying vowel-and-consonant patterns, according to a complicated formula), it took longer to carry out than an easy but deeper task (for example, deciding whether a word would fit into sentence).

The levels-of-processing explanation has some gaps in it. For one thing, the type of test used to measure memory may well influence the conclusions drawn. In other experiments, questions like "Was there something in the words you saw that rhymed with *pain*?" gave better results than the sentence task (Morris, Bransford & Franks, 1977). Apparently, then, there are cases where a shallower level of processing (the phonemic level in this case, as described in Table 2) gives better retention than a deeper level.

In addition, another contradictory finding has appeared. When subjects are presented with the same item and the same encoding question more than once ("Does the word *train* have an *n* sound?"), they remember the item better (Nelson, 1977). The second presentation does not call for any deeper processing- it requires only more of the same- and so the explanation for better recall after two trials has to be sought outside the levels-of-processing model. Furthermore, we don't yet have an objective way to measure depth of processing. We can't go by the time required, as we have seen. All we are left with is the intuitive assumption that processing by meaning is "deeper" than processing by physical characteristics. It may well be, but where is the proof?

Summary

The lecture has been able to explain the two most popular explanations of the way human memory works. These are the *storage-and-transfer model* and the *levels-of –processing model*. The first puts memory into three structures: sensory memory, short-term memory and long-term memory. The latter states that there is only one kind of memory; which is more of how deeper or shallower information is determines its ability to recall it.

Post-Test

1. Explain what recall and recognition are
2. What are the differences between recall and recognition?

References

Atkinson, R. C. & Shiffrin, R. M. (1968). Human Memory: A Proposed System and its Control Processes. In K. W. Spencer & J. T. Spencer (Eds.), *The Psychology of Learning and Motivation: Advances in Research and Theory (Vol. 2):* New York: Academic.

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Morris, C. D., Bransford, J. D. & Franks, J. J. (1977). Levels of Processing versus transfer Appropriate Processing. *Journal of Verbal Learning and Verbal Behaviour, 16,* 519-533.

LECTURE THREE

Sensory Memory

Introduction

This lecture presents a more comprehensive understanding of sensory memory as one of the three types of memory, according to Atkinson and Shiffrin (1968). Focus will be on the nature of sensory memory, kinds of sensory memory and pattern recognition in sensory memory.

Objectives

At the end of this lecture, you should be able to:

1. explain how information gets into sensory memory;
2. discuss the nature of sensory memory; and
3. explain kinds of sensory memory.

Pre-Test

1. Explain the nature of sensory memory with examples
2. Explain kinds of sensory memory.

CONTENT

Sensory Memory

With regard to sensory memory, you are a camera. You take an instantaneous “photo” of whatever you see, hear, smell, taste, or touch. For a fraction of a second, your brain absorbs the overall appearance of a room you step into, with its colors, shapes and arrangements and rumble of sounds around you on a busy street. This information is the raw data of life. You can either act upon it by taking it into your memory or ignore

and forget it. The way this kind of memory works; has been demonstrated by a series of experiments performed by Sperling (1960).

Nature of Sensory Memory

Sperling experiments demonstrated the short-lived but broad-based capacity of sensory memory. Before Sperling (1960) did his experiments, psychologists had performed many studies in which they showed people visual arrays of letters. No matter how many items were shown-from as few as eight to as many as twenty-most people could remember only four or five. The natural assumption was that this was the maximum number of items people could take at a single glimpse.

Many people insisted, however, that they had seen more items but had forgotten the others during the time it took them to report the first four or five. If you were a subject in this study, you would be shown a grid like the one in Table 3 for less than 1 second. After the grid was removed, you would hear a tone telling you to report all the letters you remembered from one of the rows. A high-pitched tone would mean the top row, a medium tone the middle row, and a low tone the bottom row. No matter which tone you heard, you would probably report three letters in any row. Since you didn't know in advance which row you would be asked about, you must have remembered about three letters from each row, or nine letters-about twice the earlier estimate of what people can absorb into sensory memory

Table 3: **Sperling's Partial Report Technique of Assessing Sensory Memory**

L B O N ←	High Tone
G R X K ←	Medium Tone
T C Y F ←	Low Tone

The percentage of information you remember would vary depending on whether you were shown a 3-by-3 grid (you would probably remember virtually everything) or 3-by-4 grid (you would probably remember 75 per cent). In either case, you would be reporting about nine items. Sperling (1960) established the fleeting nature of sensory memory. He found that if he sounded the tone after a delay of only 1 second, his subjects would remember very little.

Kinds of Sensory Memory

The kind of memory we have just been talking about, which involves vision, is known as ***iconic memory.*** (An icon is an image). Apparently, iconic images fade more quickly than images in ***echoic memory,*** which involves hearing. (An echo, of course, is the repetition of a sound). Echoic images last a bit longer, as you might have noticed if you have ever "heard" a radio continue to play after you turned it off. Although sensory information can enter through each of the five senses, most research has been done on the iconic and echoic systems.

Pattern Recognition in Sensory Memory

When you receive information through the sensory memory, you have to make it meaningful to get it into your short-term memory. You do this through a complex process in which you match in-coming sensory information with information you already have in long-term memory. If you have a name for a stimulus, you will mentally use that name. For example, suppose you see the number 7. You will immediately recognize this pattern, as you will if you see written as vii, VII, or seven. You will recognize any of these patterns in a variety of sizes, colors, typefaces or handwriting. If, however, you have never heard of the numerical concept *seven,* you will not have anything in LTM to match the 7 you see; thus, you will find it more difficult to learn and remember this new information. The intricacy of the human mind is emphasized by our ability to recognize patterns

Summary

The lecture focused on sensory memory, its nature, kinds and pattern recognition in sensory memory. Kinds of sensory memory explained are iconic and echoic memory. Finally, Emphasized the importance of patterns recognition in memory was emphasized.

Post-Test

1. What is pattern recognition in memory?
2. Explain echoic sensory memory

References

Atkinson, R. C. & Shiffrin, R. M. (1968). Human memory: A proposed system and its control processes. In K. W. Spencer & J. T. Spencer (Eds.). *The Psychology of Learning and Motivation: Advances in Research and Theory (Vol. 2):* New York: Academic.

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LECTURE FOUR

Short Term Memory

Introduction

In this lecture, efforts will be made to explain what short-term memory (STM) entails. This will give the reason why you forget information entering into your STM easily, especially, when you have not rehearsed on it very well. Finally, the lecture will cover how short-term memory and long term-memory work together.

Objective

At the end of the lecture, you should be able to:

1. explain in detail the short-term memory;
2. describe STM and LTM work together; and
3. show the importance of transfer from STM to LTM

Pre-Test

1. Discuss the capacity of STM compared to LTM.
2. How to you find material in STM?

CONTENT

Short-Term Memory

Sensory memory is the information that comes to us through our senses. However, not every material in SM makes it into STM. The stimuli that we pay attention to in SM determine what gets into STM. We obviously do not pay attention to all the competing stimuli in SM. Rather, we selectively pay attention to some, and we forget the rest. Short-term

memory is our working memory-the active memory that contains information we are currently using. What happened the last time you had to look up a telephone number to make a call at a phone centre, when you did not have anything on which to write the number down? You probably repeated the number in your head two or three times before dialing. If a friend came up to speak to you before you reached the phone centre, you would most likely forget the number and had to look it up again.

What does this common situation tell us about short-term memory? It tells us:

1. ***That Short-Term Memory Fades Rapidly***: If you had not repeated the telephone number to yourself (that is, rehearsed the material), you would have forgotten the number within seconds. In other words, when rehearsal cannot occur, short-term memory fades rapidly.
2. ***That Rehearsal Helps to Retain Material in Short-Term Memory***: With **rote rehearsal** (simple repetition), you will be able to hold onto material in short-term memory for longer than 20 seconds. We showed this in the example of looking up a telephone number. Generally, however, rote rehearsal is not the best way to get information into long-term memory. The next step is the storage-and-transfer model. For that, more meaningful rehearsal, in which the material to be remembered is associated with material we already have in LTM, is best.
3. ***That Short-Term Memory is Like Your Attention Span***: If you are distracted, you will forget whatever is in short-term memory. This can be a nuisance sometimes, but it helps to preserve sanity. Suppose that you remembered every trivial transaction you were involved in all day long. Such information would interfere with your ability to go on with other activities and to take a new material. For example, if you were waiting on tables and could not put out of your mind the orders of the previous 10 customers after they had left the restaurant, you would have a hard time remembering the orders of your current customers.
4. ***That Capacity of Short-Term Memory is Small***: "The magic number…… plus or minus two" usually defines the limit of STM (Miller, 1956). The magic number is 7, and as an average

seven is the largest number of items we can keep in STM. An item is a meaningful unit, such as a letter, digit, word, or phrase. Some people at some times, however, can remember no more than five items, while others can often remember up to nine.

We can expand the Capacity of Short-Term Memory

One way to expand short-term memory is through ***chunking,*** or grouping items into meaningful units. You can remember telephone numbers more easily, for example, if you break them into three chunks-the exchange plus two groups of two-digit number, instead of seven numbers in a row. Chunking does not expand short-term memory indefinitely, however. Once you reach the limit of the amount of information you can store there, any addition of new information will cause the old information to be displaced, unless it has been stored in long-term memory.

How We Find Information in Short-Term Memory

If we have stored information in STM, we can get it very quickly. This has been demonstrated in experiments performed by Sternberg (1966). Through these experiments, Sternberg (1966) explored two issues- first, whether people examine items in STM one at a time (serial processing) or globally, all at once (parallel processing); and second, whether the search of material in STM is self-terminating (ends when we have found the test item in STM) or exhaustive (we scan all digits in the memory set). He concluded that retrieval from STM is serial (rather than parallel) and exhaustive (rather than self-terminating) and that retrieval is extremely rapid.

How Short-Term Memory and Long-Term Memory Work Together

Imagine yourself a carpenter in a workshop, with all your materials neatly organized on shelves. As you prepare to build a cabinet, you take wood, a saw, and a hammer from the shelves and put them on your workbench, saving some room to work on. Soon you realize that you need some nails and clamps, and so you lay them down on the bench, too. Before long, your bench is such a jumble of tools and materials that there is no room to work. You stack some boards in a neat pile, but still things keep falling off the table. So you put some of the materials and tools you are finished with back onto the shelves to leave some room to work on, and you go ahead to finish the job.

In the analogy, created by Klatzky (1980), the workbench represents short-term memory, known as *working memory;* the shelves represent long-term memory, the repository of much information we don't need at the moment but have stored. Short-term memory contains a limited amount of activated material in current use, while long-term memory contains a great deal of encoded currently inactive material. If we stretch this analogy and assume that the shelves have a magical ability to refill themselves when we take materials to the workbench, we can appreciate the way short-term and long-term memory overlap. Something can be in both STM and LTM at the same time

Another way to look at the differences between these two types of memory, and at the way they are related, is to realize that, according to the model we have presented, everything we learn has to go through STM before it reaches LTM. Once it does, it is (at least theoretically) capable of being activated so that we can work with it. Whatever we want to retrieve from LTM has to go through STM before we can use it. Not all information though gets into LTM. Some of it falls off the workbench onto the floor, where it gets swept up and thrown out, rather than put on the shelves.

It is easy and more or less automatic to pick up materials from the workbench (and memories from STM), whereas you have to search for what you want on the shelves (or in LTM). However, once you have stored something on a shelf (in LTM), it is not likely to fall off and disappear-even if you are distracted. What does happen is that material stored on shelves for a long time sometimes gets warped or distorted. So do memories.

Importance of Transfer from STM to LTM

Supposed you never transferred anything from short-term to long-term memory. If you met someone today, you would have to learn his or her name again tomorrow, and the next day, and the day after. If you went out, you would not be able to remember your way home from one day to the next day. You would have to keep re-learning the same information over and over again, because of the limited capacity of short-term memory.

Summary

This lecture has been able to explain in detail what short-term memory is, and why information in it does not last for a long time. The lecture further gave an insight into how STM and LTM work together and the importance of transfer from STM to LTM.

Post-Test

1. Why does transfer important in memory?
2. How do STM and LTM work together?

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Klatzky, R. L. (1980). *Human Memory* (2d ed.). San Francisco; Freeman.

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LECTURE FIVE

Long-Term Memory

Introduction

This is another lecture that comprehensively explains another type of memory called long-term memory. This involves various kinds of long-term memory and forms of encoding in long-term memory.

Objectives

At the end of this lecture, should be able to:

1. explain how information is stored in the long-term memory;
2. discuss kinds of long-term memory; and
3. explain forms of encoding in long-term memory

Pre-Test

1. What is procedural memory?
2. What is episodic memory?

CONTENT

Long-Term Memory

Let's get back to our analogy of the carpenter's workshop. Those shelves that represent long-term memory seem to have another magical quality: *unlimited capacity.* However, the way you place your tools on the shelves is crucial for later retrieval. If you throw everything on to the shelves haphazardly, you may never be able to find the tool you want when you need it. If you organize the tools, according to a system, they will be easier

to find. Long-term memory is often described as similar to a card catalogue in a library, a complicated filling system, or a book index.

Kinds of Long-Term Memory

Psychologists are now studying the different types of information in LTM, distinguishing between **procedural memory** (i.e. information about how to do various things, like riding a bicycle, solving puzzles and playing golf) and **declarative memory** (i.e. knowledge about facts, like names, dates, faces and golf scores). There are two types of declarative memory: *episodic and semantic*. Episodic memory (sometimes called autobiographical memory) is a type of declarative memory that involves memory about our own experience. Semantic memory is a type of declarative memory that involves meaning independent of our own experiences. This suggests that some aspects of memory may decay while others may continue to function.

As we shall see when we discuss the biological basis of memory, it seems that declarative and procedural memory may be controlled by different mechanisms and different parts of the brain.

Encoding in Long-Term Memory

How would you get to your memory of your birthday in 1975? Suppose you had celebrated it with a picnic at the Millennium Park in Abuja. You might get it by thinking of picnics or parks in general, of Millennium Park in Abuja, of the people you were with that day, of the foods you ate, of the mosquitoes that bit you, of the birthday celebration, or of any of a number of others "indexes". You would have organized these memories (i.e. encoded them) in some way that makes sense to you. The more associations you have with a piece of information, the easier it will be for you to remember. You won't however, store every single detail of an experience. You won't remember every word spoken during the 3 hours you were at the park, or every person seen; rather, you will just remember the highlights. Encoding involves encoding through association, encoding through organization or the "tip of the tongue".

1. ***Encoding Through Association***: We can think of rehearsal as a continuum. We can memorize information by rote rehearsal (simple repetition) to get it into long-term memory. In general, though, the more elaborate the rehearsal (i.e. the more associations

you can make between the new information and information you already know), the more effective the encoding and storage of the information. This type of rehearsal, known as ***association rehearsal,*** in which connections are made between new and old information, helps us remember information better in the long run. *How can you improve your memory?* Associational rehearsal can help you remember many kinds of information.

2. ***Encoding Through Organization***: Association rehearsal is one kind of organization. Think back to the shelves in the workshop. The better you organize material to stack pm those shelves, the easier it will be to find it. When material is presented in an organized way-by categories of related items, for instance-it is easier to remember than when it is presented at random (Boustfield, 1953). When material is presented at random, most people tend to organize it themselves by a technique known as ***clustering*** that is, ***grouping items into categories***. This is the rearranging in the mind the order in which the items were presented. We impose our own subjective organization on unrelated items.
3. ***The "Tip of the Tongue"***: You run into someone whose name you're sure you know, but no matter how hard you try, you can't come up with it. Is it Dele or Demilade or Debowale? You know none of those are right-but you have the feeling you are on the right track. You try to remember where you met him. You keep probing until you visualize the motor park, and you see a man wearing a blue t-shirt. Suddenly, you remember. His name is Adewale! Sequence like this goes in our heads all the time; they are called ***"tip-of-the-tongue" (TOT)*** states. There are situations in which a person cannot recall a word, image or other memory immediately but does have some knowledge of it. Sometimes, we find such a memory quickly; sometimes, we find it after several hours; and sometimes we never find it at all. After 56 college students heard definitions of 49 fairly uncommon words (such as *apse, nepotism, cloaca, ambergris, and sampan*) and were asked to supply the word, they came up with a total of 360 TOT states. One definition they were given was, "A navigational instrument used in measuring angular distance, especially the attitude of sun, moon,

and star at sea." Before you read the next paragraph, write down a word or words to fit this definition.

If you don't know the word, you are likely to search your memory and come up with words like *astrolabe, compass, dividers, and protractor,* all of which are similar in meaning to the target word. Or, you might go off in a different direction, coming up with words like *secant, sextet, sexton,* all of which resemble the sound of the word you are looking for. Most people encode material into memory, according to two basic signals-how a word sounds and what it means. In all cases of positive TOTs (in which the target word was eventually recalled or recognized), 48 percent of subjects came up with a word that had the same number of syllables as the target word; 57 percent guessed the initial letter, and many came up with the correct prefix or suffix. These experiments have shown that we encode items in LTM in ways other than meaning alone; and that we retrieve a word or name by the way it looks or sounds, in addition to or instead of whatever it means. (By the way, did you ever come up with sextant?)

4. ***Dual-coding hypothesis***: Other research has shown that we store, recognize, organize and retrieve material in memory through two basic systems-one using words and one using images-and that these two systems seem to involve different kinds of processing. According to this dual-coding hypothesis (Palvlo, 1975), we use imagery for information about concrete objects and events; and we use words for ideas and language. The two systems are independent but interconnected; either one can be approached individually, but they transfer information back and forth to each other. Some material seems to be stored in each of these systems, although controversy exists about the amount and type stored in each.

Summary

The lecture explained types of long-term memory; procedural and declarative memories. Also, forms of encoding in long-term memory were discussed. The forms of encoding include encoding through association; encoding through organization; tip of the tongue, and dual-coding hypothesis.

Post-Test

1. How do you encode information through association?
2. How do you encode information through organization

References

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LECTURE SIX

What Do we Remember?

Introduction

This lecture explains what you remember through your memory. You have already learned that you tend to easily remember meaningful, well-organized information. Material that is remembered well also has some other characteristics. The lecture explains few of these characteristics of the information you remember.

Objectives

At the end of the lecture, you should be able to:

1. explain the characteristics of the information you remember; and
2. differentiate between the recency and primacy effect.

Pre-Test

1. Mention some of the characteristics of information we remember
2. What is the primacy effect?

CONTENT

Characteristics of Information You Remember

1. ***You tend to Remember what is Presented First and Last (Serial-position Curve)***

If you have ever gone through a receiving line at a wedding or some other social affair, you may remember being introduced to eight or ten or so new people, one right after the other. By the time you had shaken the last hand, it's probable that you remembered the names of the two people you met

first and the two you met last-and forgot the names of those in the middle. The serial-position curve is taken as evidence for the distinction between short-term and long term memory. That is, you remember the final items (recency effect) because they are still in STM, and you remember the initial items (primacy effect) because they have entered LTM.

2. ***You tend to remember the Unusual (Von Restorff Effect)***

If someone in the middle of the line had a name that was famous or distinctive, you would remember it-provided it was not so difficult for you to pronounce or spell that you were unable to get into your memory in the first place. This tendency to remember an unusual item, regardless of its position in a list, is named after von Restorff, the psychologist who first presented it.

3. ***You tend to remember Links to Emotionally Significant Events (Flashbulb Memories)***

Late in the nineteenth century, a researcher asked 179 middle-aged and old people whether they remembered where they had been when they heard that Abraham Lincoln had been shot (Colegrove, 1982). Thirty-three years after the assassination, 127 of those questioned were able to give a full description, including the time of day, the exact location, and the identity of the person who had brought the news. This kind of autobiography memory has been called a ***flashbulb memory,*** a vivid relocation of what one was doing when one heard about a significant event (Brown & Kulik, 1977). It is "simply there, ready to appear in stunning detail at the merest hint. It is as if our nervous system took a multimedia snapshot of the sounds, sights, smells, weather, emotional climate, even the body postures we experience at certain moments" (Benderly, 1981).

The snapshot is not complete, however. It usually includes certain basic elements, such as where you were, what you were doing before the shock, who gave you the news, what you did next, and how you and others felt about the event. But it generally captures some trivial details and leaves out others. You may remember who telephoned to tell you about the explosion at Ikeja Cantonment on January 28, 2002, and at what time of the day; but you may not remember what papers were on your desk or what you were wearing. You may remember a smell of formaldehyde mingling with the scent of cut flowers, as you sat in a hospital room

listening to a red-bearded doctor tell you than an illness was even more serious than you had feared; but you may not remember the color of the walls.

The event that captures such memories can be moments out of history or out of your personal life. A flashbulb memory occurs at a moment of surprise, of shock, and of great personal, biological significance. Most flashbulb memories, however, are of events that are significant personally rather than nationally (Brown & Kulik, 1977). When a group of students were asked to report the three most vivid autobiographical memories of their lives, almost all were of personally important events, for example, events involving injuries or accidents, sports, members of the opposite sex and animals. Suppose that you saw a dangerous animal attack someone in front of you? Your life could be saved by remembering exactly what time of day it was, where you were, and what you were doing at the time of the attack, so that you could avoid such an encounter in the future.

4. ***We Reconstruct Memory by Filling in the Gaps***

We can see how our retrieval mechanism works when we search our minds for a memory, using certain clues to lead us to our goal. Suppose that someone asks you what you were doing at 12 noon exactly 1 year ago today. First you'll establish the date; then you'll probably place yourself geographically; then you may think of your usual weekly schedule; then you'll narrow your possibilities until you come up with what you want. The process does help us come up with many elusive memories. However, it also leads to "false" memories. Several lines research-with childhood memories, with the reconstruction of stories read or heard, with parents' memories of their children's development, with eyewitness testimony-all lead to the same conclusion. In their zeal to be logical and fill in the gaps, people often *invent* material and then are sure that they are *remembering* it. Filling in the gaps can have life-or death implications when it takes place in eyewitness' testimony.

Summary

The lecture has been able to explain some of the major characteristics of the information we remember. The lecture further expatiated on the differences between the primacy and recency effect.

Post-Test

1. What is recency effect?
2. How do we construct memory by filling in the gaps?

Reference

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LECTURE SEVEN

Why Do we Forget?

Introduction

How much do you remember of what you learned over the past academic year? How many of your high school classmates could you name right now? How many times a week do you forget appointments, chores and other details of everyday life? Before you groan in self-disgust, take heart; you are entirely normal. We all forget in an orderly fashion and according to a number of well-established principles. This lecture explains why we forget things.

Objectives

At the end of this lecture, you should be able to:

1. explain why we all forget things; and
2. discuss different ways we forget things.

Pre-Test

1. What is repression in forgetting?
2. What is decay in memory?

CONTENT

The pioneer memory researcher, Hermann Ebbinghaus (1913) gave us a picture of the *curve of forgetting,* which shows that forgetting is very rapid at first and then slow down markedly. After Ebbinghaus had learned a list of nonsense syllables, he forgot them in an orderly was and quite rapidly. Just 20 minutes after having learned 13 syllables well enough to recite

them twice in order without a mistake, he forgot about 40 percent of what he had learned, and by the end of the first hour he remembered only about 33 one-third percent. Over the next few days additional forgetting took place at a much slower pace, so that 6 days later, he remembered 25 percent, and 1 month later, he still remembered about 20 percent. Ebbinghaus felt that the slowness of this forgetting strongly suggested that it would have taken a very long time to forget the series entirely.

When Ebbinghaus rehearsed the list 30 additional times immediately after leaning it, he remembered the syllables much better, showing that extra time spent over-leaning, or studying, material that you want to remember can often pay off. Eventually, however, the effects of over-learning decrease; and so over-learning needs to be done within reason.

Apparently, we forget for a number of different reasons. Each of the following theories probably gives us at least a partial answer to the question: Why do we forget? The complete answer, however, is still unknown.

Motivated forgetting (i.e. repression)

Sometimes we forget material in long-term memory because not remembering seems to provide some personal benefit. Thus, you forget the name of someone you don't like or the dentist's appointment you don't want to keep. You repress (i.e. block from consciousness) memories that are sad, embarrassing, or painful. Or, you glorify your past; bringing your memories into line with an ideal picture you would like to have of yourself.

Repression is an unconscious process. It is triggered by our need to protect ourselves against the anxiety that we would feel if particular memories were retrieved. For example, Freud says that we do not remember the feeling of sexual attraction we once had for our parents of the other sex, because memories of those early sexual feeling would produce anxiety. We unconsciously repress those anxiety-producing experiences.

Decay of the Memory Trace

The basic question about most other unmotivated forgetting is whether we forget simply because a memory deteriorates, or because even though a memory is sharp, possibly for as long as we live, we can't get at it to

retrieve it. Some influential theorists, such as Atkinson and Shiffrin (1968) and Tulving (1977), maintain that we lose material from short-term memory because of the decay of an ***engram,*** a memory trace "engraved" upon the nervous system after learning has taken place. However, anything stored in long-term memory stays there forever and any forgetting of the information is due to difficulty in retrieval. Other researchers take strong issue with this point of view, claiming that there is little basis for the widespread belief in permanence of long-term memories. Theorists, who maintain that there is a memory trace and that it is subject to decay, believe that it will persist when used but will eventually disappear if it is not used.

Poor Perception: Sometimes your perception may have been too weak for something to make much of an impression in the first place. This may come about because of external conditions: noise, darkness, or some other circumstance that interferes with observation. If, for example, you saw a man in a moving car at least 60 feet away from you, who was visible only for the time it took the car to travel 50 or 60 feet, it would be hard to remember what the man looked like, because you never got a good look at him. Poor perception may also be due to some quality of the observer. You might be distracted; you might be under stress; or you might not be paying attention, because you don't think a particular item is terribly significant. This becomes a problem when bystanders who were not paying close adequate attention are suddenly called upon to testify about a crime, an accident, or some other event that caught them by surprise.

Inability to Rehearse: Sometimes, a memory decays because we don't have the opportunity to rehearse what we want to remember. If you look up a phone number and you are prevented from going over it in your head, you may not be able to remember it long enough to make your call and will almost certainly lose it right afterward. But, this applies only to short-term memory. Once something has been stored in long-term memory, you don't have to keep rehearsing it.

Interference

A different theory of forgetting is that the reason we forget is not decay but interference. Other information learned earlier or later *interferes* with our memory. Let's consider the two kinds of interference.

Proactive Interference (PI): This describes a situation in which information that you have already learned interferes with your ability to remember new information. The prefix *pro* means *before;* the interfering task is learned *before* you learned the task on which you are tested. For example, when you run into a woman you knew when she was single, who then took her husband's last name after marriage. Even though you have learned her married assumed surname, you are apt to think of by her the name you first learned rather then the one you had just learned about her later-if you remember her name at all. The principle of proactive interference suggests that you would remember a person's name more easily if you had to learn only one name.

Retroactive Interference (RI): Information that we learn later causes a kind of barrier that interferes with our ability to remember material learned previously. The prefix *retro* means *backward;* the interfering task, learned after you learned the task on which you are interested, exerts a backward influence. The new material takes over, obliterating the old, even if we learned it well. In studies of retroactive interference, the experimental group learns material A and then B, and then recalls A. The control group is not exposed to B at all. In these experiments, too, the control group remembers the material better, indicating that the experimental group's attention to new material is blocking the memory of the old material.

Failure of Retrieval

Have you ever seen someone you usually see at the beach or the tennis court in a situation where you are both formally dressed, and have a terrible time figuring out who that familiar-looking person could be? When one of you finally makes the connection, he/she is sure to say, "Oh, I didn't recognize you with this type of dress" That kind of forgetting is ***cue-dependent forgetting,*** the inability to remember information because appropriate retrieval cues are not present.

In cue-dependent forgetting, the memory trace is there, but we cannot get at it-which shows that normal people often have difficulty retrieving memories, just as amnesiacs do. Our environment is different; the cues we depend on for retrieval are no longer present, and the memory is therefore inaccessible. In the example above, you are away from the environment

where you usually see this person, and the person is dressed differently; in other words, the cues for recognition are not there. Many contemporary psychologists feel that we often can't get at our long-term memories because we don't have appropriate cues to call them up, rather than because there is decay or interference.

Summary

The lecture has explained different ways in which we forget things. These ways include repression, failure of retrieval, interference, decay of the memory trace, etc.

Post-Test

1. How does interference affect memory?
2. How does failure of retrieval affect memory?

Reference

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LECTURE EIGHT

The Biological Basis of Memory

Introduction

For decades, psychologists have tried to pinpoint the physiological mechanism underlying memory. This lecture explains how and where memories are stored in the brain. It looks at some of the most compelling theories explaining biological basis of memory.

Objectives

At the end of the lecture, you should be able to:

1. explain the biological basis of memory; and
2. discuss know the theories explaining the biological basis of memory

Pre-Test

1. Explain the biological aspect of memory.
2. How laboratory experiment is carried out in explaining biology of memory?

CONTENT

How we study Biological Aspect of Memory

Researchers study the way experience (and thus memory) affects both the structure and the chemistry of the nervous system, and how the nervous system enables us learn and then store what we learn in memory. Our data in the memory come from two types of subjects, animals and people.

Laboratory Experiments: The most common laboratory approach is *somatic intervention (soma means body)*, in which the experimenter changes some aspect of the nervous system (for example, by stimulating a part of the brain electronically or chemically) and then looks at the effects of the change on some behavior (such as speed of learning or retention of memory). In *behavioral intervention*, the investigator does something to affect a subject's behavior (such as providing formal training or an enriched environment) and then looks for structural or chemical changes in the subjects' brain (such as changes in synaptic contacts or transmitter levels in specific regions of the brain) (Rosenzweig, 1984). Experimenters usually use animals as subjects.

Studies of People with memory Disorders: Researchers have also learned a great deal from studying people with defective memories. *Amnesia* is the general term for a variety of memory disorders that arise from different causes and that affect memory in different ways. These disorders rarely come as they do in the movies, from a single blow to the head; nor do they disappear as they do in the movie-land, with another sudden shock. They are, however, the most frequent complaint of patients who have suffered strokes, infectious diseases of the brain, and traumatic injuries. Memory disorders are often the earliest signs of a number of neurological illnesses, including Alzheimer's disease.

How Memories are Stored in the Brain

An influential model of the way the brain stores memories was proposed by one of the founders of physiological psychology, D. O. Hebb (1949). Hebb assumed that the neural bases in short-term memory and long-term memory were different stages of the same memory-storage process. In short-term memory, a circuit of neurons, which Hebb called the *cell assembly*, fires in repeated patterns and creates a memory trace. This trace is unstable; but if it is maintained long enough, it causes a permanent change in physical structure of the brain. For material to go from short-term memory to long-term memory, an actual physical change of the brain is required. This change may involve better synaptic transmission, the formation of new synapses or the elimination of unused synapse- or any combination of these. The shift from a fragile memory to a permanent

change in physical structure is called ***consolidation.*** It represents the two phases of memory, short-term and long-term.

The findings from several lines of research support the basic thrust of Hebb's theory. Evidence for the existence of an unstable short-term memory that has not been consolidated into long-term memory can be seen in the effect of electroconvulsive shock on animals (usually rats) and human beings. The experimenter places electrodes on an animal's head and passes an electric current-strong enough to produce seizure-through the animal's brain. If the animal is shocked immediately after having learned a task, such as running a pathway in a maze, it will lose all memory of the experience. But if the shock is delay for some time after the learning experience, perhaps 1 hour or so after a rat has learned a maze; the animal does not forget what it has learned.

Where Memories are Stored in the Brain

During most his professional life, the physiological psychologist, Karl Lashley, was occupied by one consuming activity-a search for the *engram,* or memory trace. He tried for decades to find specific locations in the brain where memory traces existed. In his research, Lashley taught rats various tasks, including running mazes and discriminating between stimuli; then he surgically produced lesions (injuries) in various parts of the rats' cortices; and finally, he tested the rats' memories for the tasks they learned. But after his research, he was unable to find a specific region of the cortex which when lesioned would invariably produce impairments in memory. He finally joked "I sometimes feel, in reviewing the evidence on the localization of the memory trace, that …… learning is just not possible" (1950, P.477).

While it is probably true that memories do not settle into isolated chunks of brain tissue, more recent studies indicate that certain brain structures play a more important role in memory than others do. In particular, parts of the limbic system that lie under the temporal lobes seem essential for establishing new permanent memories. Researchers now believe that different types of memory (such as procedural and declarative memory) involve different areas of the brain. One line of research, for example, has located one type of procedural memory in a particular region of the cerebellum. Researchers have classically conditioned rabbits to blink their eyes to a tone that has been sounded just

before a puff of air. The rabbits will stop blinking in response to the tone if brain cells in specific region of the cerebellum are destroyed, by either surgery or chemicals. But they will still blink to the puff of air, showing that the reflex itself is not affected-only the conditioned response is changed. The cerebellum is not the only seat of memory. Other research has shown that destroying parts of the hippocampus of an animal makes it impossible for the animal to learn more difficult tasks.

Summary

The lecture has explained the biological basis of memory. It was stated that data on memory studies come from either animal through laboratory experiments or from people with memory disorders. The lecture further stated how and where memories are stored in the brain.

Post-Test

1. What is consolidation in biological basis of memory?
2. What is amnesia?

References

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LECTURE NINE

Memory Disorders

Introduction

We don't' realize how much we depend upon memory for every aspect of day-to-day life until we see how devastating its loss can be. Simple lapses of memory are annoying; more severe losses can be life-threatening; major losses force people out of the world at large and into lonely pocket of isolation. This lecture will discuss memory disorders; types and theories of amnesia.

Objectives

At the end of the lecture, you should be able to:

1. mention the major categorical causes of or types of memory disorders;
2. discuss the theories of amnesia (memory loss); and
3. explain the two basic of memory loss.

Pre-Test

1. What is organic amnesia?
2. What is psychogenic amnesia?

CONTENT

Organic Amnesia

Organic amnesia is a memory disorder that can be attributed to physiological illness or injury. There are two basic kinds of memory loss. In ***anterograde amnesia,*** a disorder characterized by inability to create

new permanent memories, patients typically cannot learn the names of their doctors of the hospitals they are in, or any other new information they are exposed to *after* the traumatic event or illness that caused the amnesia. In ***retrograde amnesia,*** a disorder characterized by inability to recall information that had been learned *before* the onset of the amnesia, patients may not remember experiences in their earlier life or the name of the president of Countries.

The hippocampus and amygdale, both parts of the limbic system, have been shown to be crucial brain structures responsible for memory. Patients who have the cerebral cortex of their temporal lobes removed, without the destruction of the hippocampus and the amygdale, do not show the profound amnesia and research on animals supports this conclusion. Surgical lesions of both of these structures affect the ability to learn new information (Mishkin, 1982). Rats with lesions of the hippocampus have problems with spatial memory tasks, and monkeys with bilateral lesions of the hippocampus and amygdale develop memory deficits similar to profound one.

Damage to regions of the brain other than temporal and limbic structures can only produce severe memory disorders. An instance of memory loss arising from injury to the thalamus can be seen in the case of a young man, N. A., who suffered a lesion in this part of the brain. A friend who had been fooling around with a miniature fencing foil accidentally stabbed N. A. The foil entered a nostril and went to the base of his brain, causing, a severe anterograde amnesia. N. A.'s memory lost is much milder than H. M's (who suffered a profound memory loss) and is largely restricted to verbal activities (probably because his lesion occurred in a portion of the left thalamus). His retrograde amnesia is limited to only 1 year before his accident.

Another severe memory disorder, *Korsakoff's syndrome*, is a neuro-psychiatric disorder caused by prolonged, excessive alcohol abuse, coupled with a deficiency in the vitamin thiamine. Affected persons suffer both anterograde and retrograde amnesia and fill in the gaps in their memory with incorrect details. They can use language abnormally, but they have trouble carrying on a conversation because they can't think of anything to say. Postmortem examinations have shown that the lesions most typical of this syndrome are in the hippocampus but in the thalamus and hypothalamus. Memory is not located in one single region of the brain. On the contrary, many brain structures are involved in memory.

Damage to different locations produces slightly different memory disorders, causing a problem, for example, a declarative memory but none in procedural memory.

Psychogenic Amnesia

The kind of amnesia most people are aware of is actually much rarer than the kind caused by organic brain damage. This is ***psychogenic amnesia,*** a memory disorder caused by emotionally disturbing events. It differs from organic amnesia in several ways. Patients with psychogenic amnesia usually display much worse retrograde than anterograde amnesia-the opposite of the usual situation in an organic amnesia. Furthermore, psychogenic amnesiacs often lose their personal identity; organic amnesiacs almost never do. The characteristics of psychogenic memory loss are poorly understood and have only recently begun to be explored through research.

Theories of Amnesia

Precisely, where memory breaks down is a controversial issue. Some of the cognitive processes that have been implicated are described below, but the most likely conclusion is that there is no one single cause; in any individual patient, one or more information-processing mechanisms may be faulty (Brandt, 1983).

Encoding: Research in recent years has supported the possibility that amnesiacs, especially those with Korsakoff's syndrome, analyze in-coming information too superficially, failing to engage in the deep-level encoding that, according to depth-of-processing theory, makes for stable memory traces.

Consolidation: Since experiments with electroconvulsive shocks have shown that information is most likely to be forgotten during a definite period of time after learning, it is possible that amnesia is caused by the failure to consolidate information into more permanent memory trace.

Retrieval: The tendency of some amnesiacs to make an unusual number of "intrusion errors" (that is, to report previously acquired information when they are trying to retrieve task-relevant material) suggests that faulty

retrieval may be based on proactive interference, or excessive interference from previously learned information.

Summary

This lecture has been able to explain what memory disorders are. Amnesia (memory loss) is explained to have organic or psychogenic causes. Organic amnesia is a type of memory loss having a particular or some physical/biological cause. Psychogenic amnesia on the other hand, is a type of memory loss that results from some emotionally disturbing situations. Theories of amnesia include encoding, consolidation and retrieval.

Post-Test

1. Discuss someone theories of amnesia
2. What is the major difference between organic and psychogenic amnesia?

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