

**AL AKHAWAYN UNIVERSITY**

**PSY1301**

**INTRODUCTION TO PSYCHOLOGY**

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**MEMORY**

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- In 2013, Simon Reinhard sat in front of 60 people in a room at Washington University, where he memorized an increasingly long series of digits. On the first round, a computer generated 10 random digits—6 1 9 4 8 5 6 3 7 1—on a screen for 10 seconds. After the series disappeared, Simon typed them into his computer. His recollection was perfect. In the next phase, 20 digits appeared on the screen for 20 seconds. Again, Simon got them all correct. No one in the audience (mostly professors, graduate students, and undergraduate students) could recall the 20 digits perfectly. Then came 30 digits, studied for 30 seconds; once again, Simon didn't misplace even a single digit. For a final trial, 50 digits appeared on the screen for 50 seconds, and again, Simon got them all right. In fact, Simon would have been happy to keep going. His record in this task—called “forward digit span”—is 240 digits!

- Simon has taught himself simple strategies for remembering that have greatly increased his capacity for remembering virtually any type of material—digits, words, faces and names, poetry, historical dates, and so on. Twelve years earlier, before he started training his memory abilities, he had a digit span of 7, just like most of us. Simon has been training his abilities for about 10 years, and has risen to be in the top two of “memory athletes.” In 2012, he came in second place in the World Memory Championships (composed of 11 tasks), held in London.
- [https://www.youtube.com/watch?v=\\_lbDCzji\\_Zk](https://www.youtube.com/watch?v=_lbDCzji_Zk)

# INTRODUCTION

- The memory was the first phenomenon to be studied in a psychological laboratory (Ebbinghaus 1884).

**Ryburn defines memory as “the power we have to store our experiences and to bring them into the field of consciousness sometimes after the experiences have occurred”**

- The memorising process are organised in the form of memory traces which functions like a computer.

# HOW MEMORY FUNCTIONS

Memory is an information processing system like a computer. It is a set of processes used to encode, store and retrieve information over different periods of time.

1. Encoding involves the input of information into the memory system.
2. Storage is the retention of the encoded information.
3. Retrieval, is getting the information out of memory and back into awareness.



# ENCODING

When the brain receives information from the environment it:

- Labels/codes it.
- Organizes it with other similar information.
- Connects new concepts to existing concepts.

Encoding occurs through 2 types of processing:

**Automatic processing** – encoding of details like time, space, frequency, and the meaning of words.

- Usually done without conscious awareness.

**Effortful processing** – encoding of details that takes time and effort.



When you first learn new skills such as driving a car, you have to put forth effort and attention to encode information about driving. Once you know how to drive, you can encode additional information about this skill automatically.

# TYPES OF ENCODING

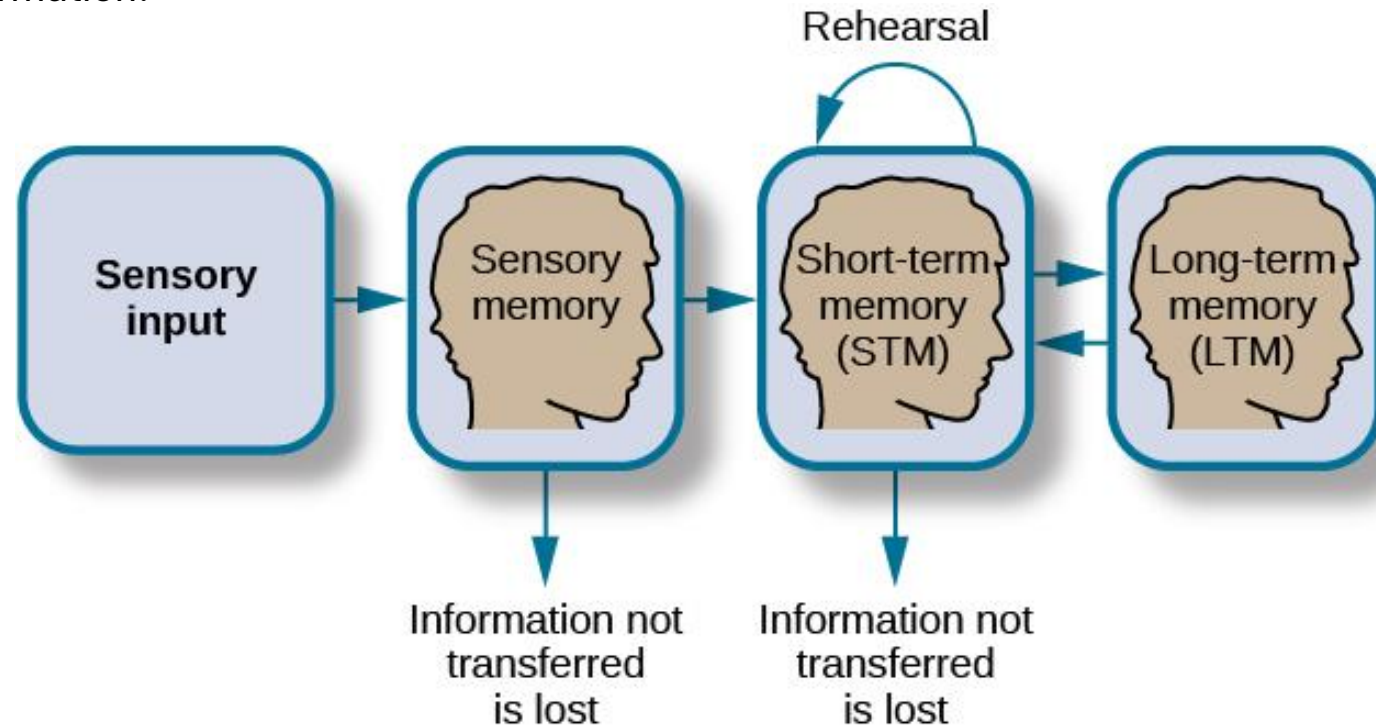
1. **Semantic encoding** – encoding of words and their meanings.
2. **Visual encoding** – encoding of images.
  - Words that create a mental image, such as *car*, *dog*, and *book* (concrete words), are easier to recall than words such as *level*, *truth*, and *value* (abstract words).
3. **Acoustic encoding** – encoding of sounds.

# STORAGE: A-S MODEL

Storage is the creation of a permanent record of information.

## Atkinson-Shiffrin Model of Memory

- Information passes through three distinct stages in order for it to be stored in long-term memory.
- Based on the belief that memories are processed the same way that a computer processes information.





# **Recognition Test**

# Recognition Test

<b>LION</b>	<b>BEAR</b>	<b>PIG</b>
<b>COW</b>	<b>CHICKEN</b>	<b>BIRD</b>
<b>ELEPHANT</b>	<b>GIRAFFE</b>	<b>DOG</b>

# Recognition Test

■ Which of the following words was not on the list?

■ A. Lion

■ B. Chicken

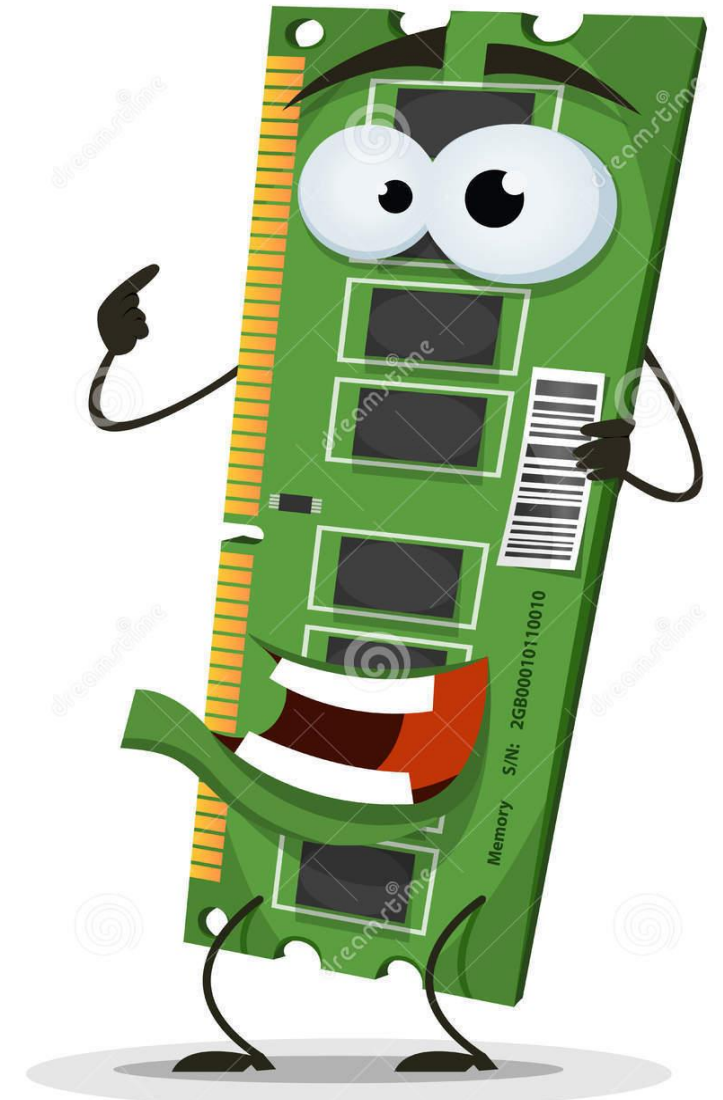
■ C. Elephant

■ D. Tiger

■ E. Dog

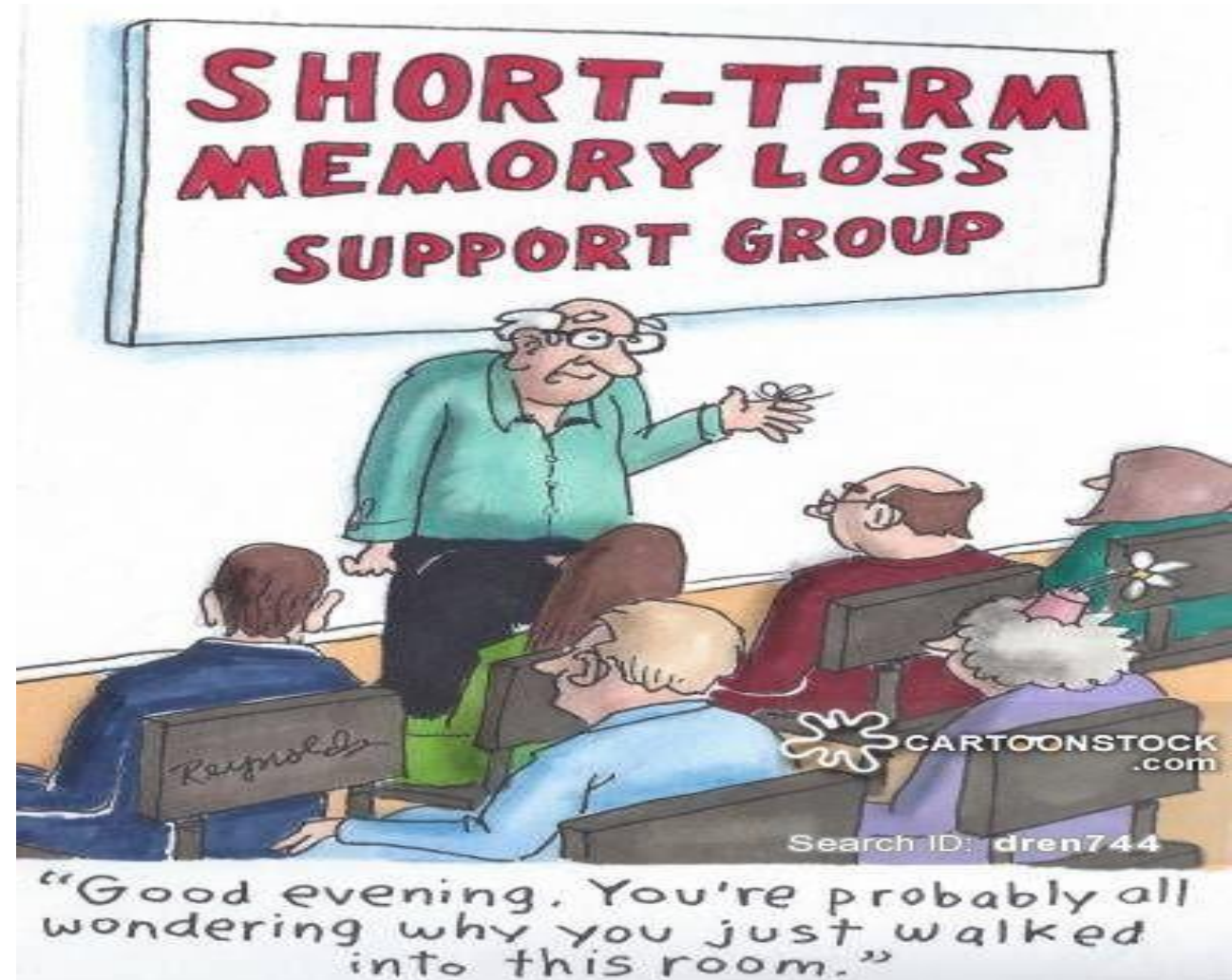
# DEFINITION:

“The power to store experience and to bring them into the field of consciousness sometimes after the experience has occurred is called Memory.”



# TYPES OF MEMORY

- A. SENSORY MEMORY .
- B. SHORT TERM MEMORY.
- C. LONG TERM MEMORY.



# A) SENSORY MEMORY

**Sensory memory** – storage of brief sensory events, such as sights, sounds, and tastes.

- Stored for up to a couple of seconds.
- First step of processing stimuli from the environment.
- If the information is not important, it is discarded.
- If the information is valuable then it moves into our short-term memory.

# Sensory Memory



1) Iconic Memory.

2) Echoic Memory.

## **ICONIC MEMORY :**

It is a type of sensory memory that briefly stores visual information after we perceive it. It allows the brain to retain visual details for a fraction of a second, which helps in processing and integrating visual stimuli.



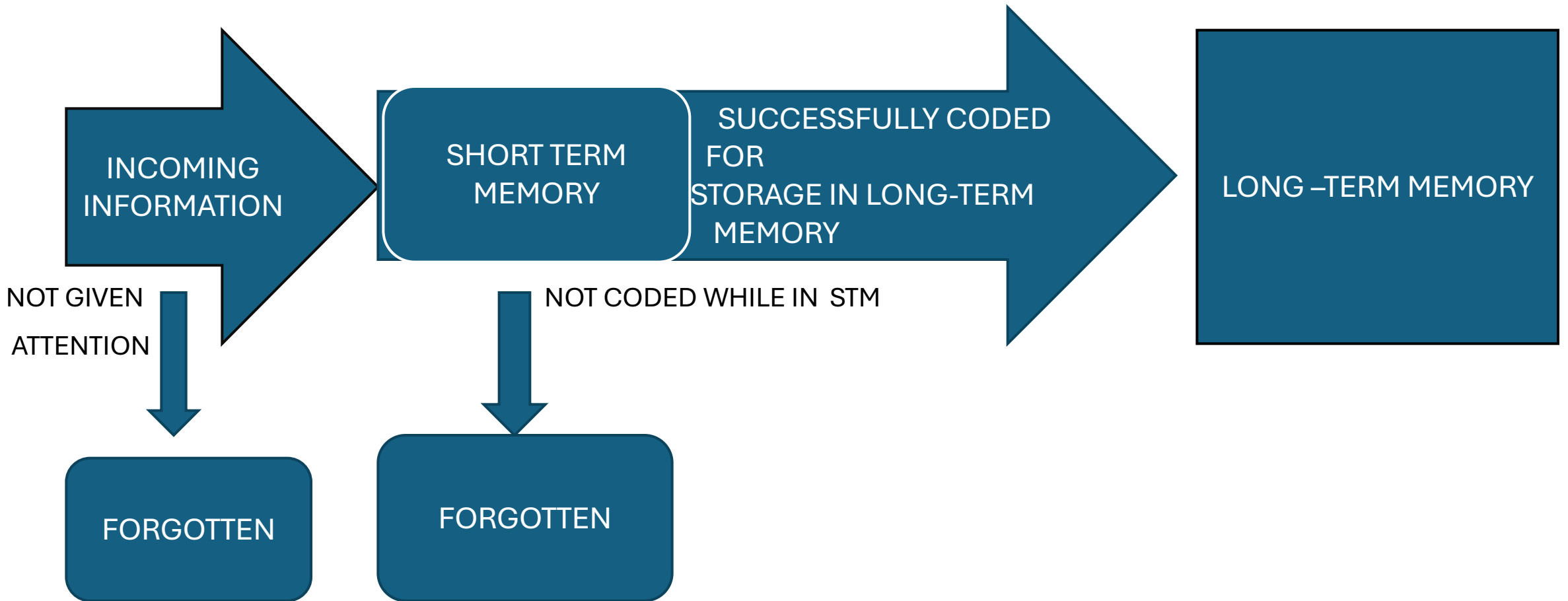
# ECHOIC MEMORY

**Echoic memory** is the auditory component of **sensory memory**, where sounds are briefly stored for processing. This type of memory allows the brain to retain and make sense of auditory information even after the sound stimulus has ended. It plays a vital role in understanding speech, identifying environmental sounds, and engaging in conversations.

## **B) SHORT TERM MEMORY**

- Short term memory holds a relatively small amount of information about seven items for a short period of 15-30 seconds .
- The types of information stored consists of sounds, images, words or sentence.
- Information from Short term memory may be transferred to long term memory through either maintenance rehearsal.

# REHEARSAL



## **C) LONG TERM MEMORY**

- The long term memory has the unlimited capacity to store information for days, months, years, and even a lifetime.
- Information may be lost or, at least, not retrieved from long-term memory because of difficulties in the search process or interference by other long-term memories.

# LTM: EXPLICIT MEMORY

**Explicit (declarative) memory** – memories of facts and events we can consciously remember and recall/declare.

Explicit memories include two types:

**Semantic** – knowledge about words, concepts and language.

- Knowing who the President is.

**Episodic** – information about events we have personally experienced.

- Remembering your 5<sup>th</sup> birthday party.
- The what, where, when of an event.
- Also called autobiographical memory.
- A small number of people (including actress Marilu Henner) have a highly superior autobiographical memory known as hyperthymesia.

# LTM: IMPLICIT MEMORIES

**Implicit memory** - memories that are not part of our consciousness.

- Formed through behaviors.

**Procedural** – stores information about how to do things.

- Skills and actions.
- E.g. how to ride a bike, tie your shoe laces, drive.

Implicit memory also includes behaviors learned through emotional conditioning.

- You might have a fear of spiders but not consciously remember why or what occurred to condition that fear.

# RETRIEVAL

*How do you get information back out of storage?*

**Retrieval** – the act of getting information out of memory storage and back into conscious awareness.

Retrieval is needed for everyday functioning (e.g. , knowing how to drive to work or how to perform your job once you get there).

## 3 ways to retrieve information:

1. **Recall** – being able to access information without cues.
  - Used for an essay test.
2. **Recognition** – being able to identify information that you have previously learned after encountering it again.
  - Used for a multiple choice test.
3. **Relearning** – Learning information that you previously learned.
  - After learning Spanish in high school, you might forget how to speak it if you do not use it. However, if you try to relearn it, you will learn it quicker than the first time.

# PARTS OF THE BRAIN INVOLVED IN MEMORY

## Amygdala

- Involved in fear and fear memories (memory storage is influenced by stress hormones).
- Processes emotional information important in encoding memories at a deeper level and memory consolidation.

## Hippocampus

- Associated with explicit memory, recognition memory and spatial memory.
- Projects information to cortical regions that give memories meaning and connect them with other memories.
- Involved in memory consolidation.
- Damage leads to an inability to process new declarative memories.

## **Patient H.M:**

- Had both temporal lobes removed (including hippocampi) to help control his seizures.
- Declarative memory was significantly effected.
- Could not form new semantic knowledge or episodic memories.

[https://www.youtube.com/watch?v=pxvSJP3P\\_GI](https://www.youtube.com/watch?v=pxvSJP3P_GI)



# PARTS OF THE BRAIN INVOLVED IN MEMORY

## Cerebellum

- Plays a role in processing procedural memories, such as how to play the piano
- Prefrontal cortex
- Appears to be involved in remembering semantic tasks.
- PET scans show activation in the left inferior prefrontal cortex when completing semantic tasks.
- Encoding is associated with left frontal activity.
- Retrieval of information is associated with the right frontal region.

# FLASH BULB MEMORY

**Flash bulb memory** – a record of an atypical and unusual event that has very strong emotional associations.

Depending on the age and awareness/interests of the person, certain flashbulb memories can act as generational reference points. Examples include:

Earthquake in Morocco, 2023

Flashbulb memory formation may depend on cultural reference and personal investment/involvement.

- A national leader suddenly resigning may become a flashbulb memory for those citizens only.
- An athlete suddenly retiring may become a flashbulb memory for fans of that sport or team.

# How Flashbulb Memories Are Formed

- **Emotion and the Amygdala:**
  - Emotional events trigger the **amygdala**, a brain region involved in processing emotions, which enhances memory consolidation in the **hippocampus**.
- **Surprise and Novelty:**
  - The surprising nature of the event heightens **arousal**, leading to deeper encoding of the memory.
- **Rehearsal and Retelling:**
  - Flashbulb memories are often **rehearsed** or discussed with others, further strengthening them in memory.

# AMNESIA

**Amnesia** – the loss of long-term memory that occurs as the result of disease, physical trauma, or psychological trauma.

There are 2 common types:

**Anterograde amnesia** – inability to remember new information after point of trauma.

- Commonly caused by brain trauma.
- Hippocampus is usually affected – causes inability to transfer information from STM to LTM.

**Retrograde amnesia** – loss of memory (partial or complete) for events that occurred prior to the trauma.



# EYEWITNESS MISIDENTIFICATION

Eyewitness identification and testimony are often used in the prosecution of criminals.

Research suggests that suggestive police identification procedures can lead to alterations in an eyewitness's memory, leading to misidentification.

## Why Does Eyewitness Misidentification Happen?

### Misinformation Effect

Witnesses may incorporate **incorrect information** received after the event (e.g., through police suggestions or media reports) into their memory of the original event, distorting their recall.

**Example:** A witness might mistakenly remember a suspect wearing a hat because of hearing this detail during questioning, even if the suspect was not wearing one.

### Memory Reconstruction

- Memories are **not static**; they are reconstructed every time they are recalled, making them susceptible to **distortions**. Stress, time, and repeated retelling can alter memories, leading to **inaccurate identification**.

# THE MISINFORMATION EFFECT

## Elizabeth Loftus

- Studied false memories.

**Misinformation effect paradigm** – after exposure to incorrect information, a person may misremember the original event.

### **Study (1974):**

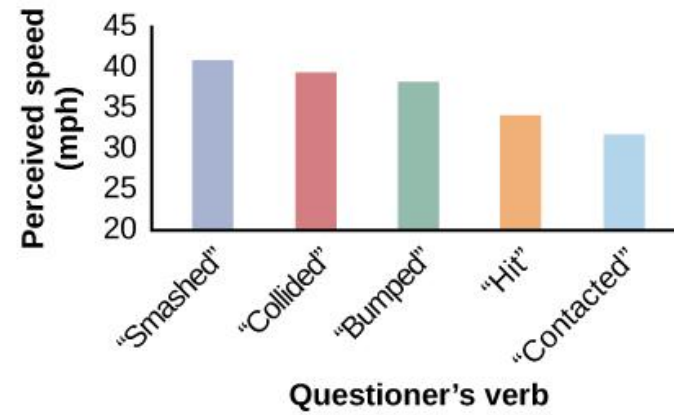
- Asked college students to estimate the speed of cars using different forms of questions.
- Participants were shown films of car accidents and were asked to play the role of eyewitness and describe what happened.
- Were asked, “About how fast were the cars going when they (*smashed, collided, bumped, hit, contacted*) each other?”
- Participants that heard the word **smashed** estimated that the cars were traveling a lot faster than those that heard the word contacted.
- If they heard the word **glass**, they were more than twice as likely to say they remember seeing glass (a false memory).
- The implied meaning of the word used influenced the participants memory of the accident.

# LOFTUS STUDY



(a)

Perceived Speed Based on Questioner's Verb  
(Source: Loftus and Palmer, 1974)



(b)

When people are asked leading questions about an event, their memory of the event may be altered.

# REPRESSED & RECOVERED MEMORIES

## Repressed Memories

- Repressed memories refer to traumatic experiences that the mind **pushes out of awareness** to protect the individual from emotional pain or psychological distress. This repression is thought to act as a **defense mechanism**.
- **Example:**
  - A person who experienced **childhood abuse** might not remember the event during adulthood because the memory is repressed.

## Recovered Memories

- Recovered memories refer to **previously inaccessible memories** that return to consciousness. This recovery can happen naturally or as a result of **therapy**, often involving techniques such as **hypnosis, guided imagery, or free association**.
- **Example:**
  - During therapy, an individual may suddenly **recall an abusive incident** from childhood that they had no conscious memory of before.



# WHY DO WE FORGET?

**Forgetting** – loss of information from long-term memory.

## Encoding Failure

Encoding failure occurs when the memory is never stored in our memory in the first place.

Successful encoding requires effort and attention.

# Recall Test


# Recall Test

<b>HATE</b>	<b>Appel</b>	<b>HAPPY</b>
<b>MAD</b>	<b>CURIOUS</b>	<b>MEAN</b>
<b>CALM</b>	<b>ENRAGED</b>	<b>Man</b>

- **write down as many words as you can remember.**

# Recall Test

<b>Mountain</b>	<b>Clock</b>	<b>Bicycle</b>
<b>Elephant</b>	<b>Lemon</b>	<b>River</b>
<b>Guitar</b>	<b>Book</b>	<b>Window</b>

- **write down as many words as you can remember.**

# MEMORY ERRORS

## Schacter's 7 sins of memory

Psychologist **Daniel Schacter** identified seven common ways in which memory can **fail** or become distorted. These "sins" are categorized into three types: **forgetting, distortion, and intrusion**. Each sin describes a particular way our memories are prone to error.

### 1. Forgetting Type

These errors occur when we fail to remember information when needed.

#### 1.1 Transience

- **Definition:** Memory becomes less accessible over time due to **storage decay**.
- **Example:** You forget the details of a book you read a year ago.
- **Reason:** Memories fade if they are not **retrieved or rehearsed** regularly.

#### 1.2 Absentmindedness

- **Definition:** Forgetting happens due to **lapses in attention** during encoding or retrieval.
- **Example:** Forgetting where you put your keys because you weren't paying attention when you placed them down.
- **Reason:** When you are **distracted** or not fully focused, the brain fails to properly encode information into memory.

#### 1.3 Blocking

- **Definition:** Memory is temporarily **inaccessible** despite knowing it is stored (aka the **tip-of-the-tongue phenomenon**).
- **Example:** You try to recall the name of an actor you know but can't retrieve it at that moment.
- **Reason:** Interference or a mental block prevents retrieval, but the information may later come back unexpectedly.

## 2. Distortion Type

These errors involve **inaccuracies** in how memories are recalled or interpreted.

### 2.1 Misattribution

- **Definition:** Confusing the **source** of a memory.
- **Example:** You believe a friend told you a story, but you actually read it in a book.
- **Reason:** Memory content is **accurate**, but the **source** is confused.

### 2.2 Suggestibility

- **Definition:** Memory is distorted by **external suggestions**, creating false memories.
- **Example:** A witness, when asked if they saw a "red car," later recalls the car as red, even though it was blue.
- **Reason:** **Misinformation** influences memory recall, making the memory inaccurate.

### 2.3 Bias

- **Definition:** Memories are **distorted** by our **current beliefs** and feelings.
- **Example:** You believe you were always a great student, even though your report cards say otherwise.
- **Reason:** Your **present mindset** influences how you reconstruct past events.



### 3. Intrusion Type

These errors involve **unwanted memories** that repeatedly intrude into consciousness.

#### 3.1 Persistence

- **Definition:** Inability to **forget** distressing or unpleasant memories.
- **Example:** Repeatedly thinking about a painful breakup or a traumatic event, even when you try to move on.
- **Reason:** Strong **emotions** and trauma enhance memory retention, making it difficult to let go of the past.

### Conclusion

Schacter's 7 sins of memory demonstrate that memory is not a perfect record of events but a **dynamic, reconstructive process**. While some of these "sins" can lead to problems—like forgetting, false memories, or intrusive thoughts—they are also part of how our **cognitive system** works efficiently, helping us prioritize what is important. Understanding these sins helps us become more aware of the **limits of memory** and the **potential for error** in our recall.

# BIAS

According to Schacter, your feelings and view of the world can distort your memory of past events.

**Stereotypical bias-** Involves **memory distortions** that are influenced by **racial, gender, or other stereotypes**.

**Example:** A teacher assumes that a **male student** is better at math than a female student, even though both perform equally well.

**Egocentric bias** – Involves **enhancing memories** of the past in a way that makes oneself appear **more competent or favorable**.

Example: A student recalls doing most of the work in a group project, even though the effort was equally shared.

**Hindsight bias** – The tendency to believe, after an event has happened, that the **outcome was predictable** or inevitable all along

**Example:** After a failed exam, a student says, “**I knew I was going to fail,**” even though they didn’t expect it beforehand.

# INTERFERENCE

Sometimes, forgetting is caused by a failure to retrieve information. This can be due to interference, either retroactive or proactive.

## 1. Proactive Interference

- **Definition:** When **old information** interferes with your ability to learn or remember **new information**.
- **Example:** You keep typing your **old password**, even though you've changed it to a new one.
- **Reason:** The old memory is **stronger** and disrupts the recall of the new one.

## 2. Retroactive Interference

- **Definition:** When **new information** interferes with the recall of **older information**.
- **Example:** After learning a new address, you forget your previous address.
- **Reason:** The newly learned information **overwrites or blocks** access to older memories.

# WAYS TO ENHANCE MEMORY

- **Rehearsal** – conscious repetition of information to be remembered.

**Example of Practice and Repetition for Exams :** A student is preparing for a **biology exam**. The student rewrites **key concepts and definitions** multiple times, such as the stages of cell division or photosynthesis. Each night, they review the material, **summarize notes**, and **quiz themselves** with sample questions. By **repeatedly engaging** with the material, the student strengthens their ability to **recall information** during the exam.

- **Chunking**

- Grouping information into smaller, meaningful units makes it easier to remember.

- **Example:** Break a 10-digit phone number into smaller chunks (e.g., 12-34-56-78-90).

- **Mnemonics**

- Use acronyms, rhymes, or images to encode information creatively.

- The mnemonic **ROYGBIV** helps students **easily recall** the sequence of colors in the rainbow by linking the first letter of each color: **R**ed, **O**range, **Y**ellow, **G**reen, **B**lue, **I**ndigo, and **V**iolet.

## **Use Spaced Repetition**

- Study material over **longer intervals** rather than cramming.
- **Example:** Review notes several times over a few days or weeks.

# HOW TO STUDY EFFECTIVELY

Memory techniques can be useful when studying for class.

1. **Use elaborative rehearsal** – link information to other information/memories to make it more meaningful.
2. **Apply the self-reference effect** – make information personally meaningful to YOU.
3. **Don't forget the forgetting curve** – keep studying to prevent storage decay.
4. **Rehearse.**
5. **Be aware of interference** – study without distractions.
6. **Keep moving** – aerobic exercise promotes neurogenesis (growth of new brain cells in the hippocampus).
7. **Get enough sleep** – the brain consolidates memories while sleeping.
8. **Make use of mnemonic devices.**

