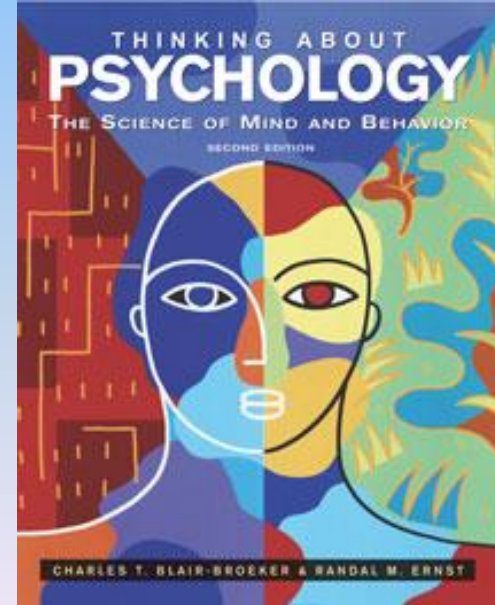# Thinking About Psychology: The Science of Mind and Behavior 2e

Charles T. Blair-Broeker

Randal M. Ernst

Cognitive Domain

Memory Chapter

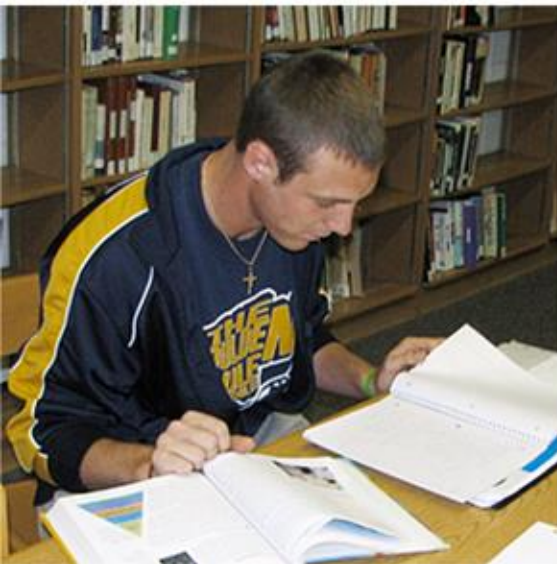# Module 22

Information Processing

Module 22: Information Processing

Introduction

Information Processing Model

- Encoding – process of getting information into the memory system

- Storage – retention encoded information over time

- Retrieval – process of getting information out of memory storage

Information Processing Model

Encoding: Automatic and Effortful Processing

Automatic Processing

- Unconscious process of encoding certain information without effort

- Usually information on space, time and frequency

Effortful Processing

- Encoding that requires attention and conscious effort

- The best processing is through rehearsal or practice.
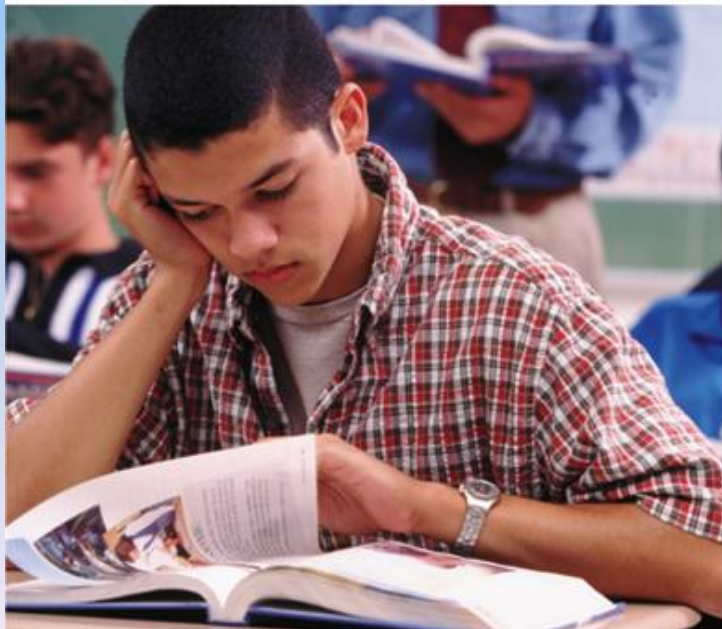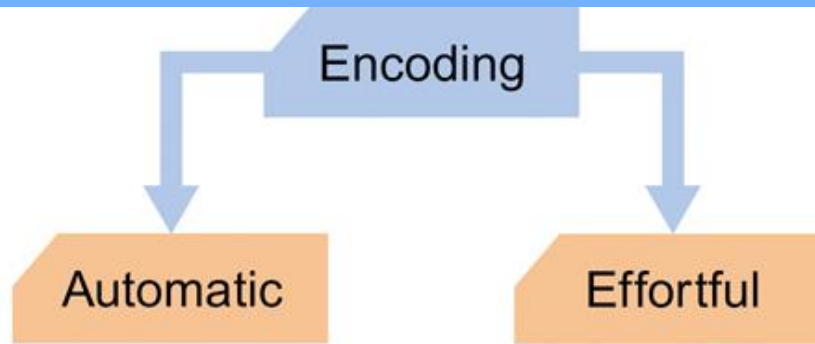
Automatic/Effortful Processing

Rehearsal

- Conscious repetition of information
- The more time spent on rehearsal, the more information one tends to remember.

Rehearsal and Retention

Time in minutes taken to relearn list on day 2

As rehearsal increases, relearning time decreases

Number of repetitions of list on day 1
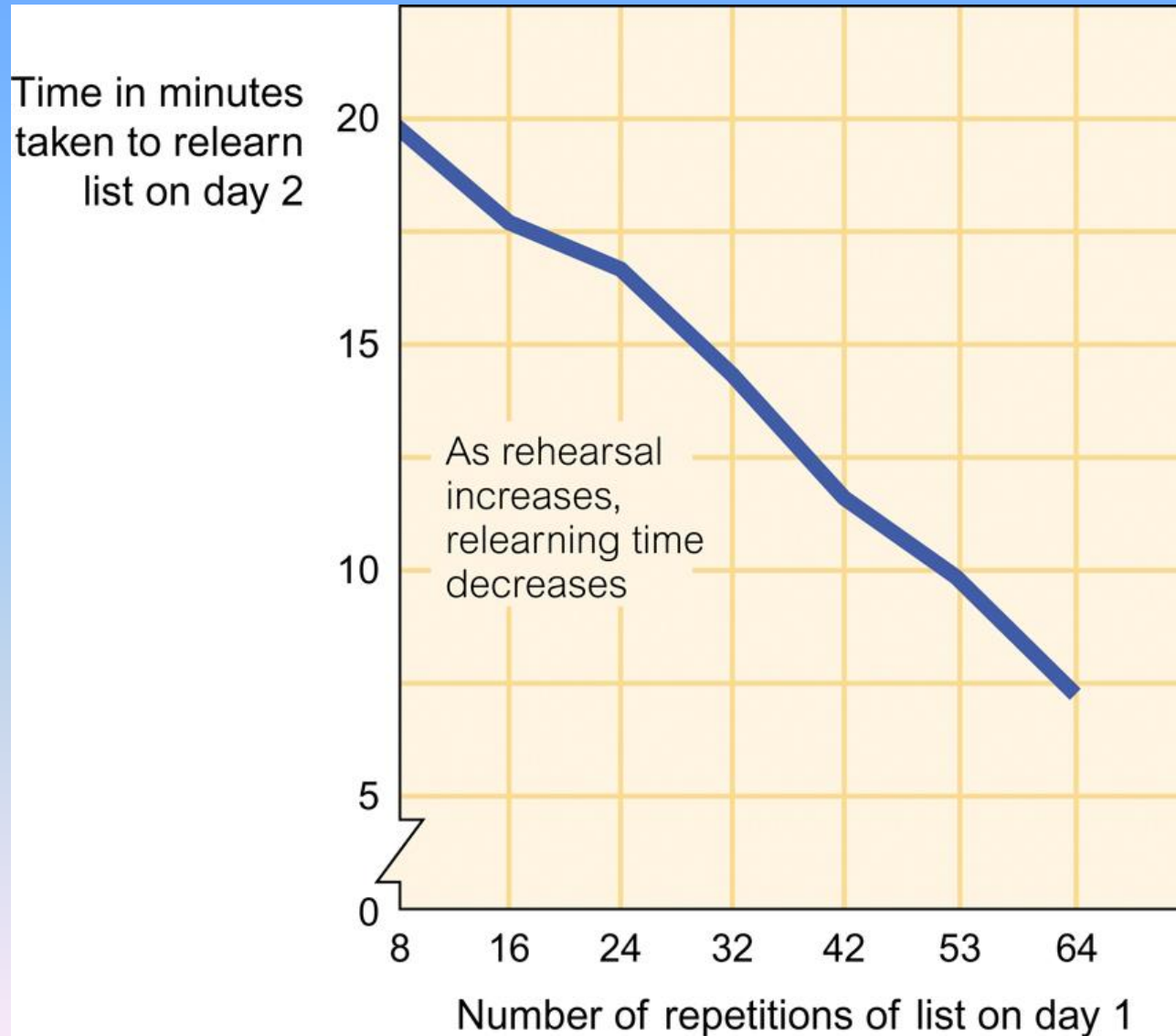
Hermann Ebbinghaus (1850-1909)

- German philosopher who did early memory studies with nonsense syllables

- Developed the forgetting curve, also called the "retention curve" or "Ebbinghaus curve"

Overlearning

- Continuing to rehearse even after it has been memorized

- Rehearsing past the point of mastery

- Helps ensure information will be available even under stress

Encoding:
Serial Position Effect

Serial Position Effect

- Tendency to recall the first and last items in a list more easily

- Primacy effect – the ability to recall information near the beginning of a list

- Recency effect – the ability to recall information near the end of a list

Primacy/Recency Effect
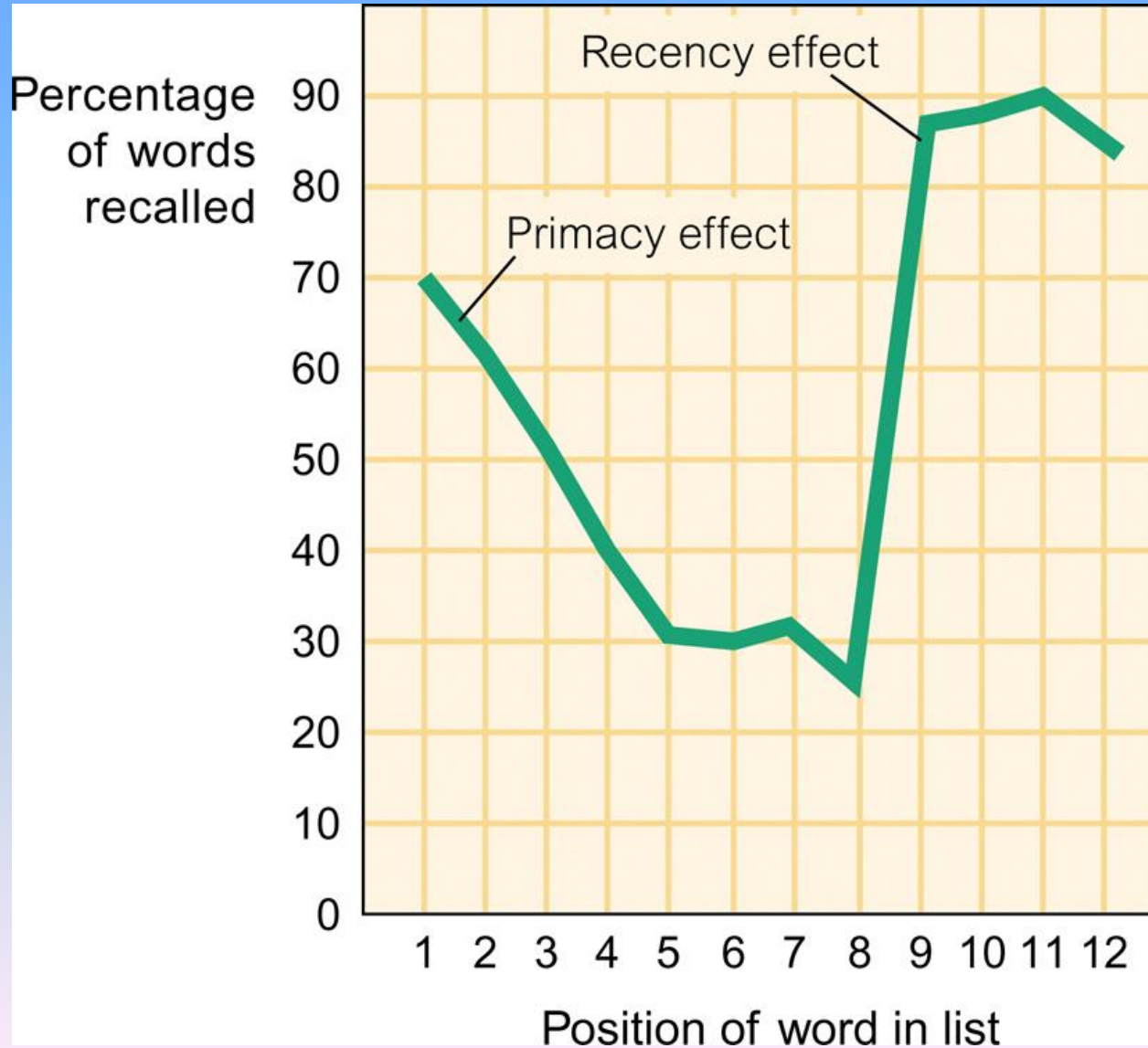
Encoding: Spacing of Rehearsal

Spacing Effect

- The tendency for distributed practice to yield better retention than is achieved through massed practice

Distributed Practice

- Spreading rehearsal out in several sessions separated by period of time
- Usually enhances the recalling of the information

Massed Practice

- Putting all rehearsal together in one long session (cramming)
- Not as effective as distributed practice

Encoding: Encoding Meaning

Semantic Encoding

- Encoding of meaning
- Encoding information that is meaningful enhances recall

Semantic Encoding
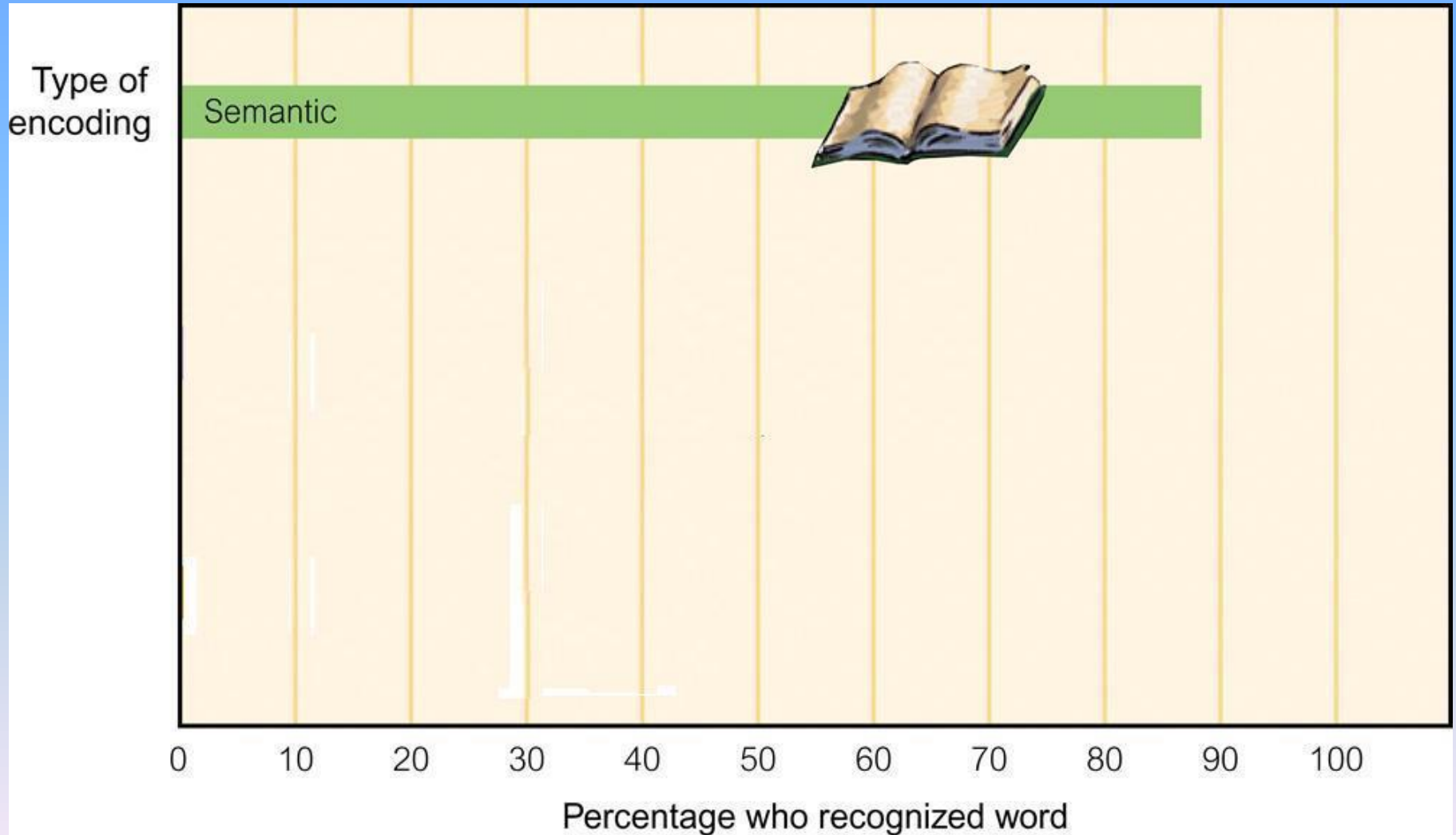
Acoustic Encoding

- Encoding information based on the sounds of the information

Acoustic Encoding
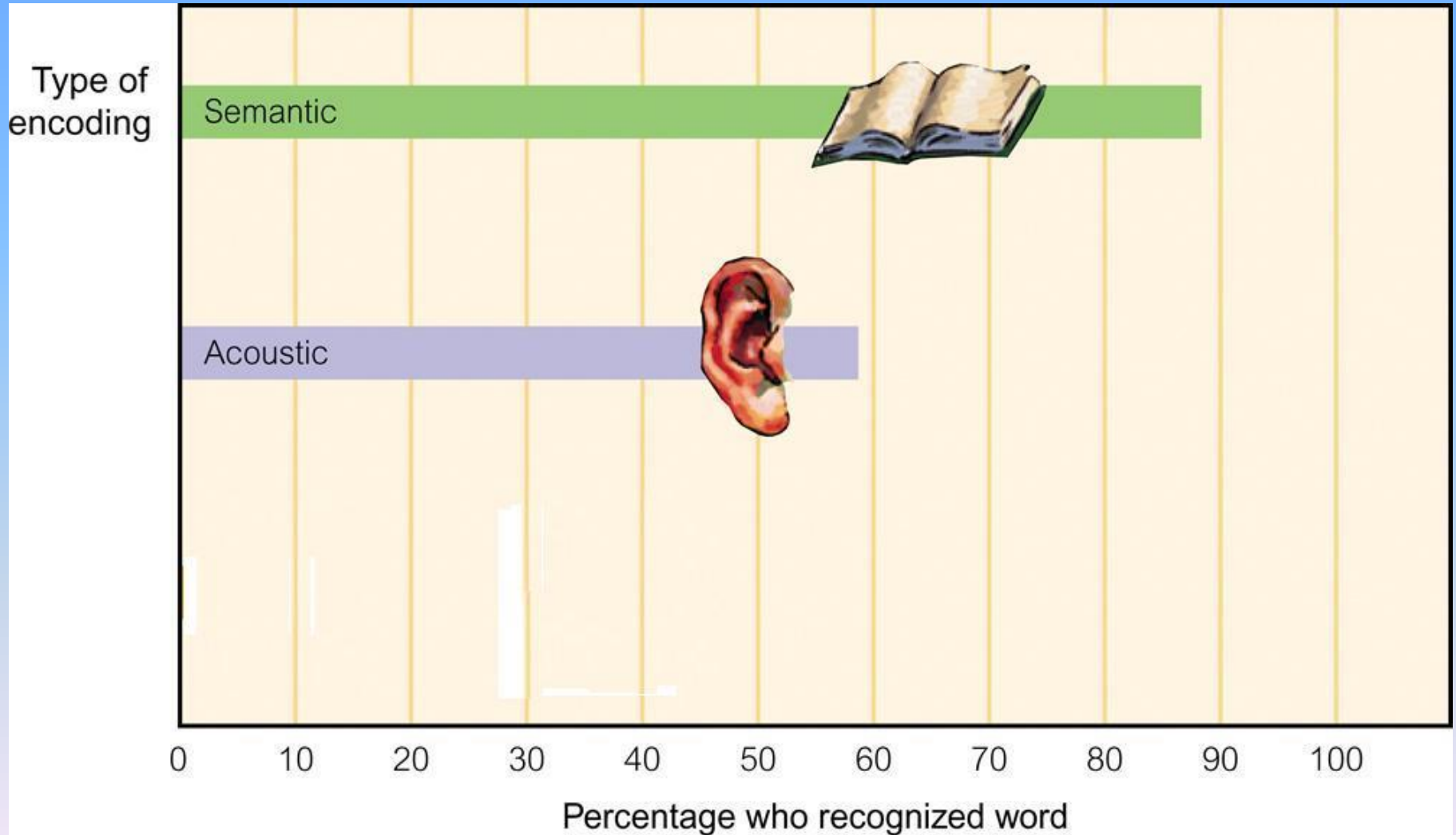
Visual Encoding

- Encoding information based on the images of the information

Visual Encoding
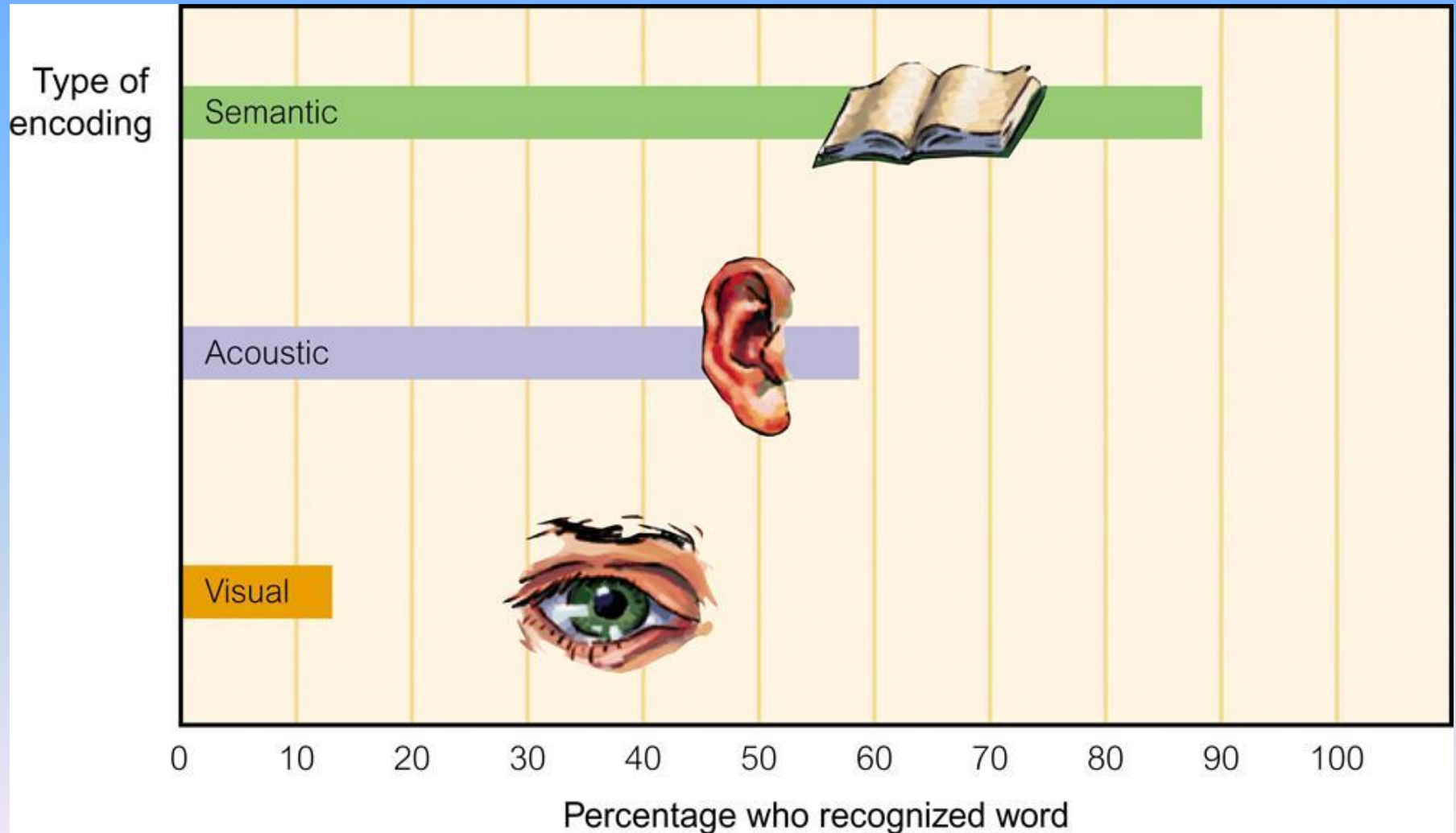
Self-Reference Effect

- Enhanced semantic encoding of information that is personally relevant
- Making information meaningful to a person by making it relevant to one's life

Encoding: Encoding Imagery

Encoding Imagery

- Visual images easily encode
- Especially extremely positive or negative images

Encoding: Mnemonic Devices

Mnemonic Device

- A memory trick or technique
- "Every good boy does fine" to remember the notes on the lines of the scale
- "People say you could have odd lots of good years" as a way to remember how to spell "psychology"

Method of Loci

- Mnemonic device in which you associate items you want to remember with imaginary places

Peg-Word System

- Mnemonic device in which you associate items you want to remember with a list of words already you have already memorized
- Goal is to visualize the items to remember with the items on the pegs

Peg Word System

One is a bun.

Two is a shoe.

Three is a tree.

Four is a door.

Five is a hive.

Six is a pile of sticks.

Seven is heaven.

Eight is a gate.

Nine is a line.

Ten is a hen.

Encoding: Organizing Information

Chunking

- Organizing information into meaningful units

- More information can be encoded if organized into meaningful chunks.

Chunking

ROW 1   RNN TYW KTYU ACDF OAHNSOO RTA UO UCR OYO

Take ten seconds to memorize the above line of letters.

Chunking

ROW 2   ASK NOT WHAT YOUR COUNTRY CAN DO FOR YOU

Take ten seconds to memorize the above line of letters.

Chunking

ROW 1	RNN TYW KTYU ACDF OAHNSOO RTA UO UCR OYO
ROW 2	ASK NOT WHAT YOUR COUNTRY CAN DO FOR YOU

TABLE 18.1 TIPS FOR BECOMING A BETTER ENCODER

1. *Rehearse.* The more time you invest in rehearsing, the more effective your memory is going to be.

2. *Overlearn.* Continue to rehearse academic information even after you think you have it mastered.

3. *Overcome the serial position effect.* Devote extra rehearsal time to the middle of lists you must memorize.

4. *Benefit from the spacing effect.* If you cram all your studying into one long session the night before an exam, you will not encode the information as effectively as you would if you space your study time fairly evenly throughout the unit.

5. *Take advantage of the self-reference effect.* One good way to add meaning to material is to relate it to your own life.

6. *Use mnemonic devices.* Memory tricks like the method of loci and the peg-word system can create vivid images that you won't easily forget.

7. *Chunk material or arrange it in a hierarchy.* You can encode more efficiently if you take a few moments to organize your information first.

Module 22: Information Processing

Storage

Three Storage Systems

- Three distinct storage systems :
  - Sensory Memory
  - Short-Term Memory (includes Working Memory)
  - Long-Term Memory

Storage: Sensory Memory

Sensory Memory

- Brief, initial coding of sensory information in the memory system
  - Iconic store – visual information
  - Echoic store – sound information
- Information held just long enough to make a decision on its importance

Storage: Short-Term Memory

Short-Term Memory

- Part of your memory system that contains information you are conscious aware of before it is stored more permanently or forgotten

- Holds approximately seven, plus or minus two, chunks of information

- Can retain the information as long as it is rehearsed

- Also called "working memory"

Short-Term Memory

Storage:
Long-Term Memory

Long-Term Memory

- Relatively permanent and limitless storehouse of the memory system
- Holds memories without conscious effort

Flashbulb Memory

- Vivid, clear memory of an emotionally significant moment or event
- Can be personal memories or centered around a shared event

Storage: Memory and the Brain

Long-Term Potentiation

- Increase in a synapse's firing efficiency that occurs when the sequence of neurons that represents a particular memory fires repeatedly
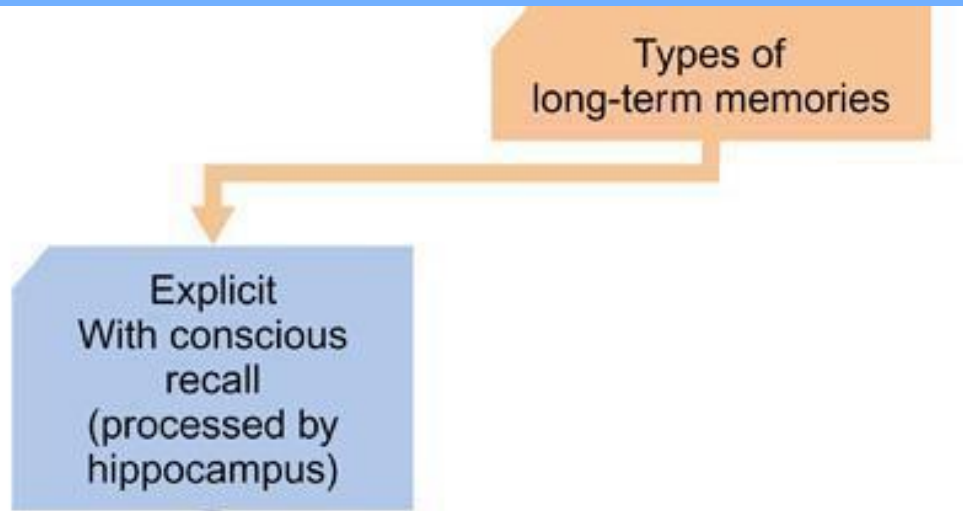- Believed to be the neural basis of learning and memory
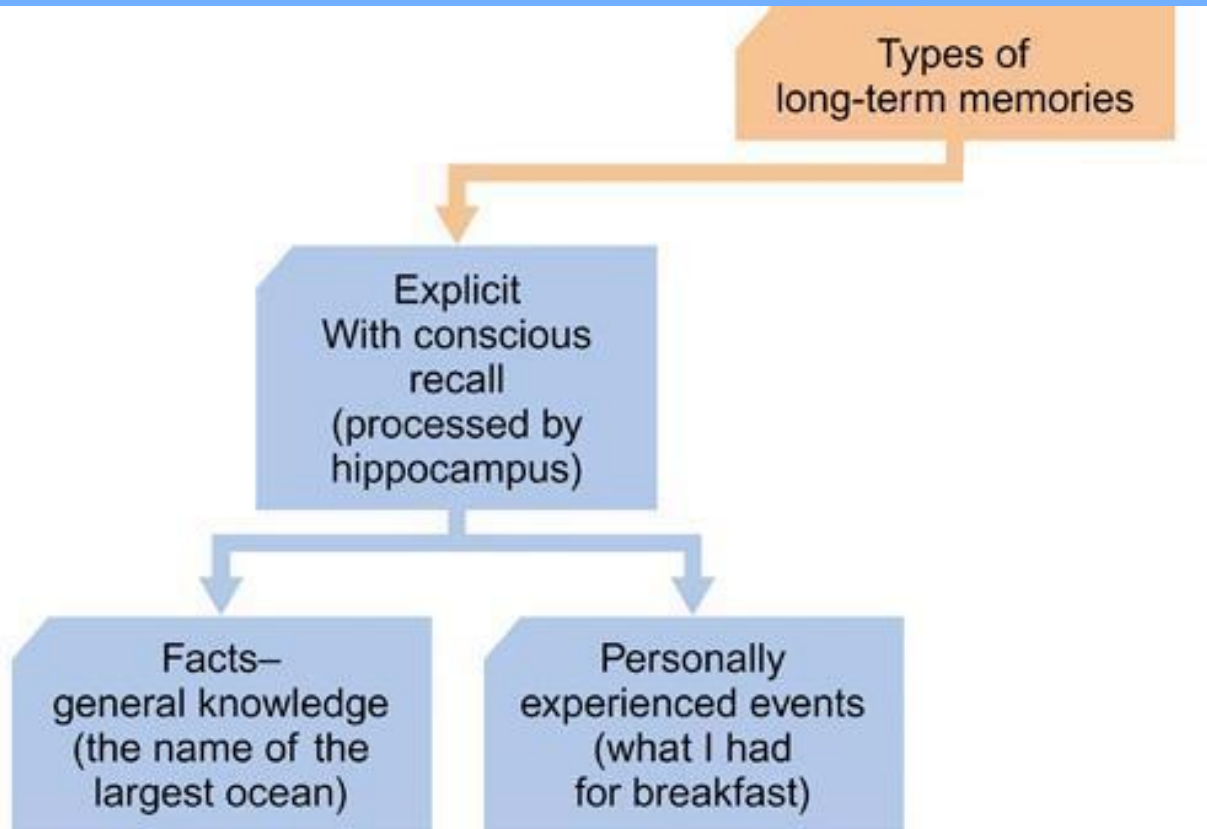
Storage: Explicit and Implicit Memories

Explicit Memory

- Memory of facts and experiences
- Processed through the hippocampus
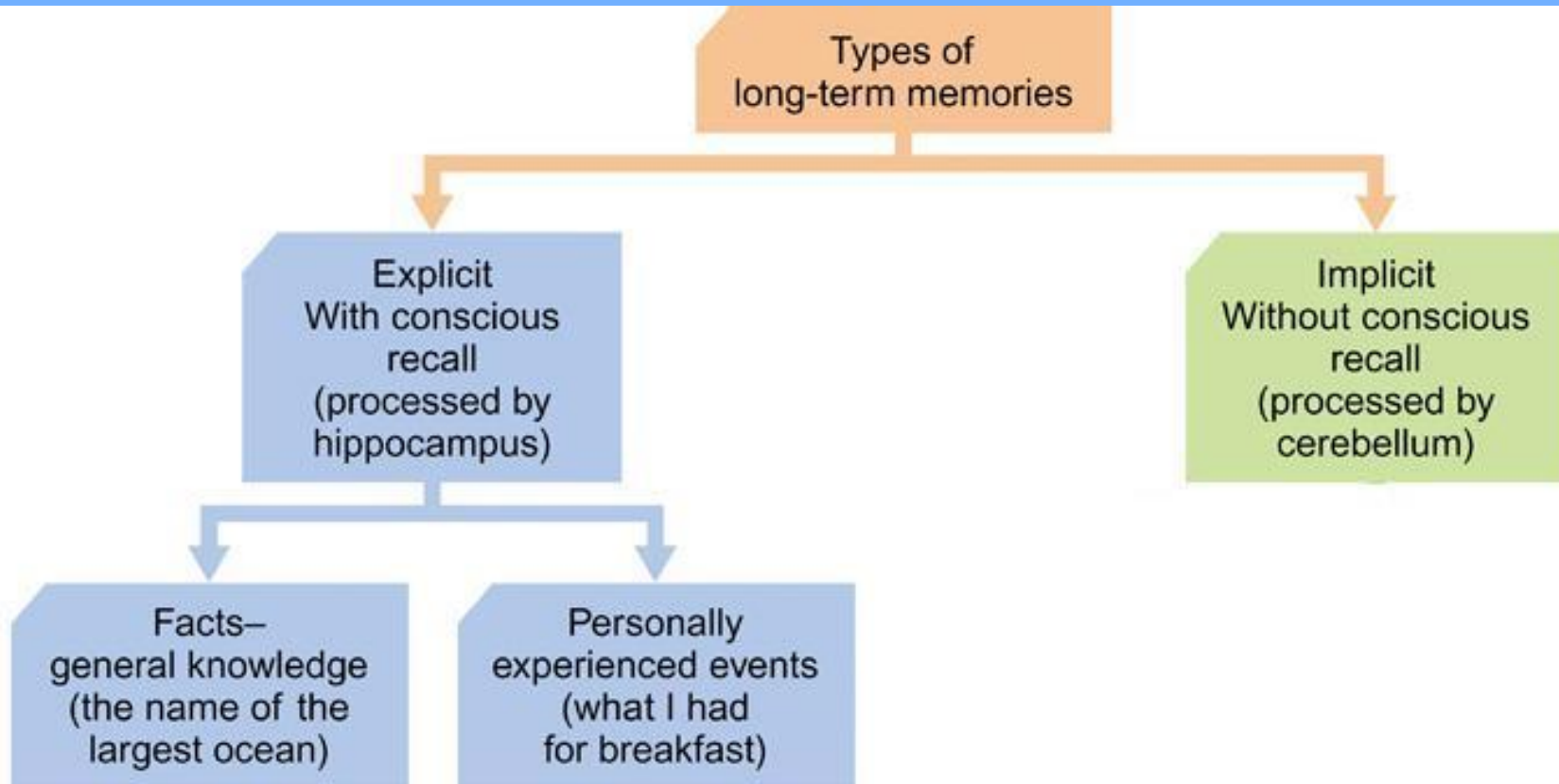
Explicit Memories
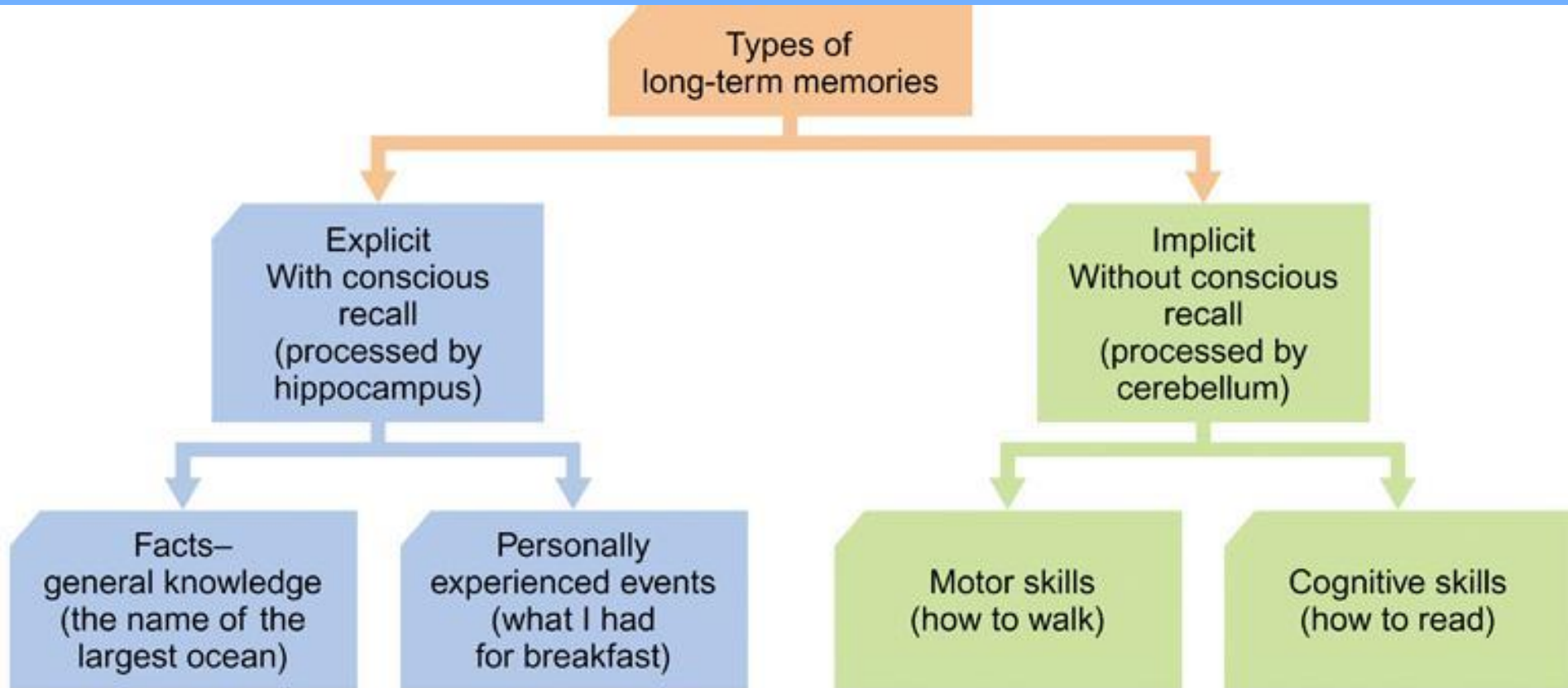
Explicit Memories

Implicit Memory

- Memory of skills and procedures
- Processed through the cerebellum

Implicit Memories

Implicit Memories

Memory and the Hippocampus

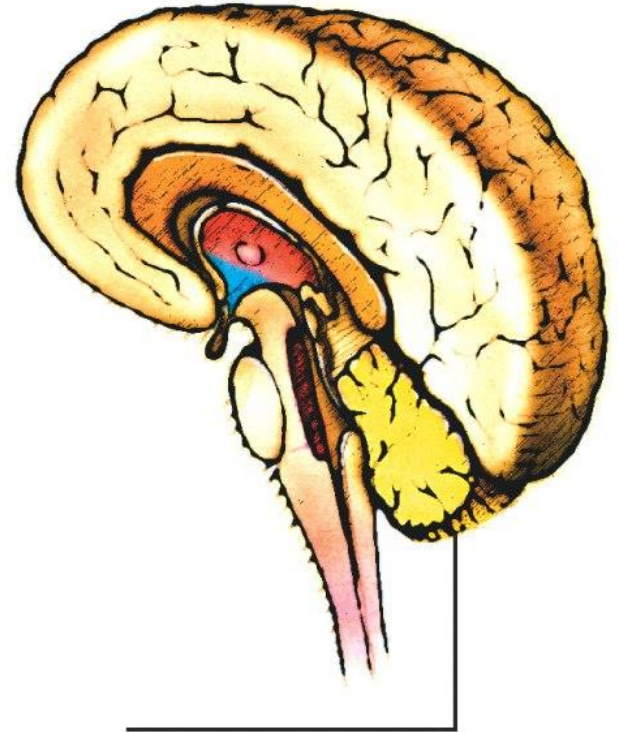- Damage to the hippocampus would result in the inability to form new explicit memories, but the ability to remember the skills of implicit memories

Memory and the Hippocampus
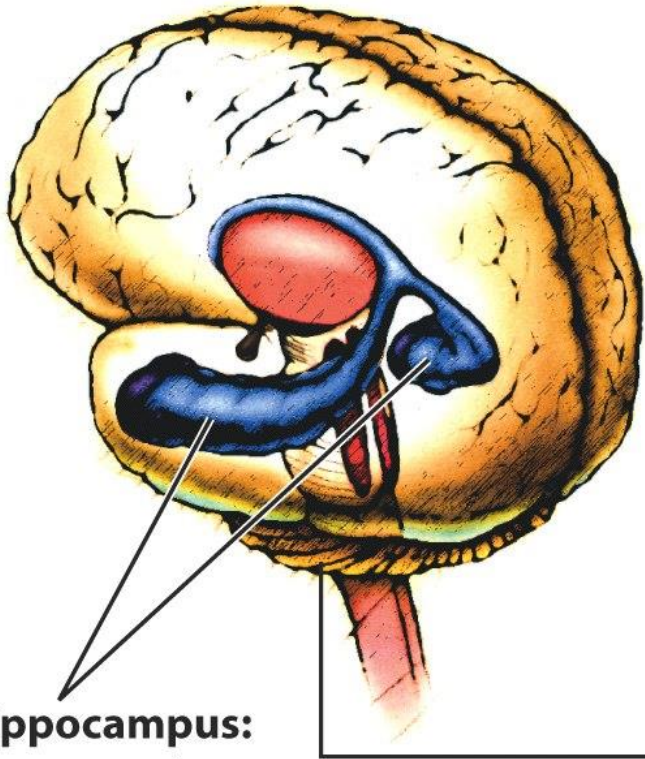
Hippocampus:
a structure in
the limbic
system linked
to explicit memory

Cerebellum:
processes implicit memory,
as well as coordinating
voluntary movement
and balance

Module 22: Information Processing

Retrieval

Retrieval

- The process of getting information out of memory storage

- Two forms of retrieval
  - Recall
  - Recognition

Recall

- Type of retrieval in which you must search for information that you previously stored

- Essay, fill-in-the-blank, and short answer test questions test recall

Recognition

- Type of retrieval in which must identify items learned earlier

- Multiple choice and matching test questions test recognition

Retrieval

Seeing or hearing the word "rabbit"

Seeing or hearing the word "barber"

Primes spelling of spoken word as h-a-r-e

Primes spelling of spoken word as h-a-i-r
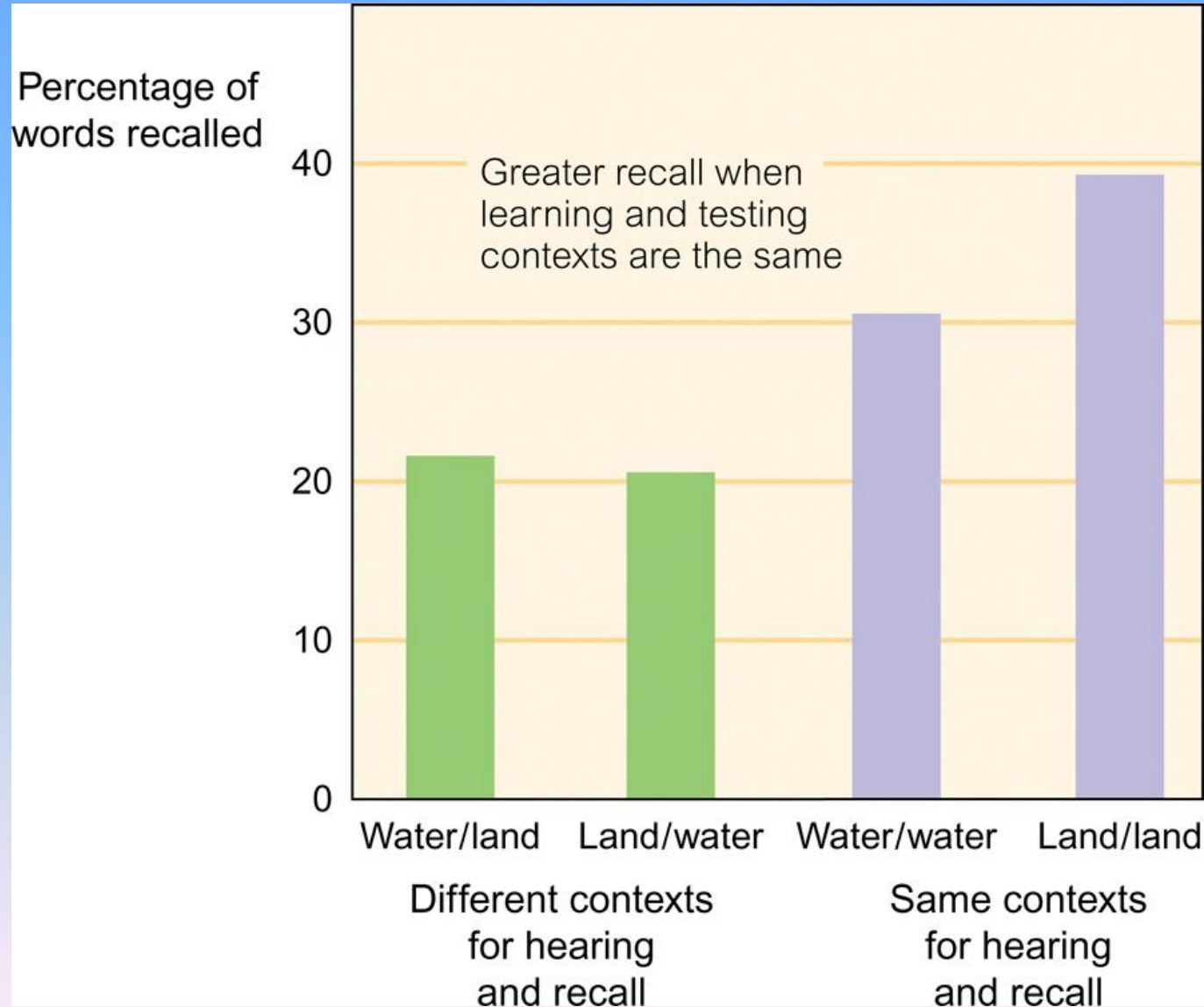
Retrieval: Context

Context Effect

- Enhanced ability to retrieve information when you are in an environment similar to the one in which you encoded the information

Context Effect

Retrieval: State Dependency

State Dependent Memory

- Enhanced ability to retrieve information when you are in the same physical and emotional state you were in when you encoded the information

- The retrieval state is congruent with the encoding state

The End