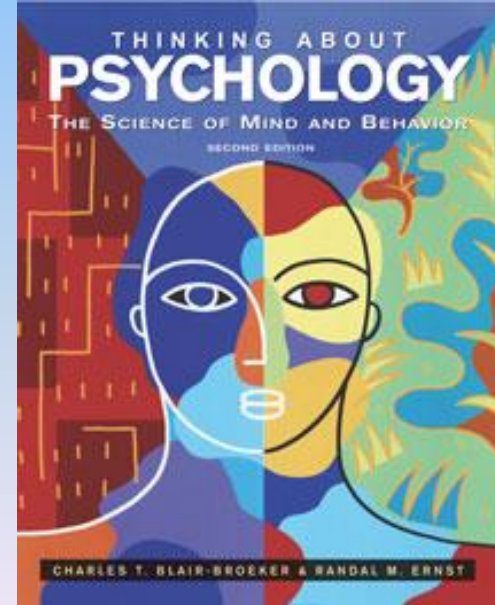


Thinking About Psychology: The Science of Mind and Behavior 2e

Charles T. Blair-Broeker
Randal M. Ernst



Cognitive Domain



Memory Chapter



Module 22

Information Processing

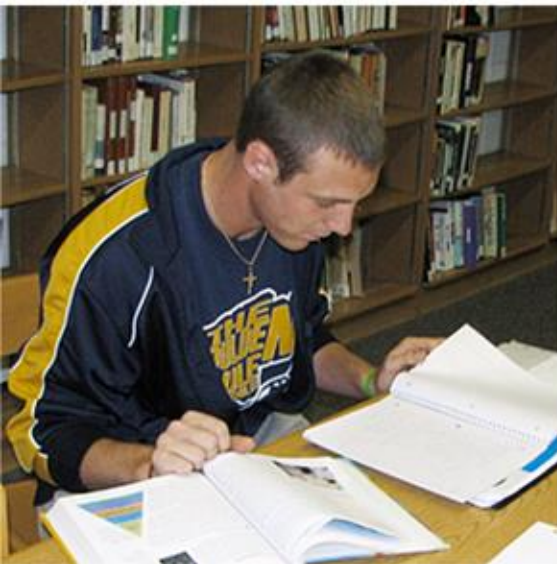
Module 22: Information Processing

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



Module 22: Information Processing

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

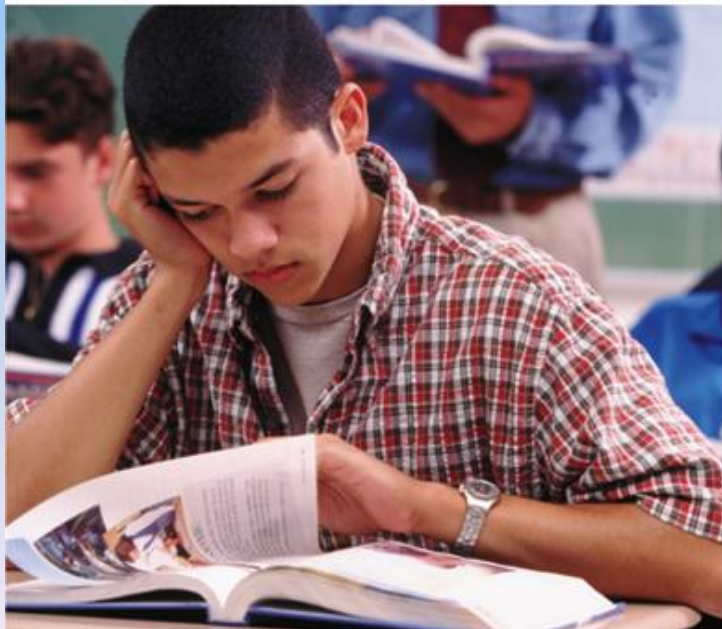
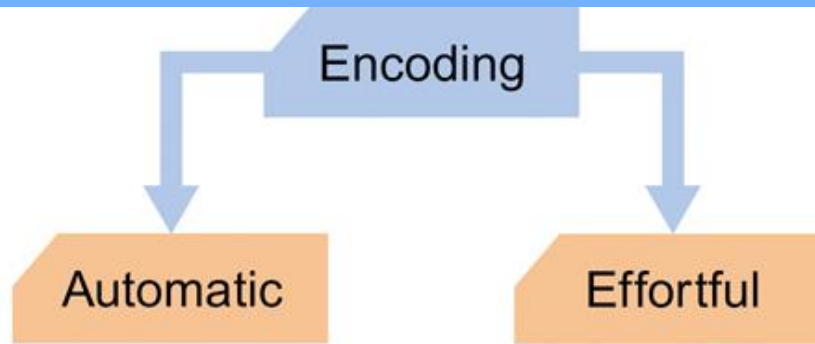


Table 1.1
Top 10 U.S. Occupations That Employ People with a Psychology Degree

1. Top- and mid-level managers, executives, administrators
2. Sales occupations, including retail
3. Social workers
4. Other management-related occupations
5. Personnel, training, labor relations specialists
6. Other administrative (social clerks, legislative operations)
7. Insurance, securities, real estate, business services
8. Other marketing and sales occupations
9. Registered nurses, pharmacists, therapists, physician assistants
10. Accountants, auditors, other financial specialists

Source: Best College Health Resources will not cover sports and health. The article lists examples and links to profiles of all college majors (2014-15). Page 7, paragraph 1. Copyright 2016 Pearson Education, Inc.

Table 1.1 shows the top 10 occupations for people who graduate with a bachelor's degree in psychology; the degree a college undergraduate earns after 4 or 5 years of study. To be a psychologist, however, you will need a graduate degree beyond a bachelor's. Most psychology graduate students take 4 to 6 years to earn a doctoral degree in one of psychology's subfields. The most common kind of psychologist is called a clinical psychologist or a clinician. These psychologists use their skills as therapists, assessment specialists, and researchers to promote psychological health in groups and individuals. The range of their work may include working to help someone overcome a phobia or to help make life better for someone with a psychological disorder such as schizophrenia. Clinicians often open up private practices, but they also work in medical systems, schools, counseling centers, government agencies, and mental health service organizations. Clinical psychologists must also pass tests to ensure competence (in conducting therapy) in the states where they practice.

When most people think of a psychologist, they picture the therapist in a chair with notebook in hand, and the patient or client talking about life's problems while reclining on a couch in the therapist's office. Contrary to popular belief, not all psychologists make a living diagnosing and treating patients for psychological problems. As stated previously, clinical psychologists and counseling psychologists do represent the largest number of professional psychologists, but psychology is made up of a number of subfields (see Figure 1.1) and psychologists work in many different locations in addition to the mental health clinics where therapy is conducted.

Figure 1.2 Psychologists at Work These data are based on membership in the APA, which tends to have a higher percentage of clinical psychologists registered than some other psychology organizations. Nevertheless, it conveys a general idea of an psychologist's specialty areas and the places that psychologists work (APA, 2016).

10 Specialty Areas in Psychology

Specialty Area	Percentage
Clinical	41%
Health	1%
Educational	2%
Developmental	2%
Experimental and other research	3%
Subsidiary	3%
Industrial/organizational	5%
Social and personality	6%
Counseling	11%
Other	16%

10 Where Do APA Psychologists Work?

Work Location	Percentage
University/other	34%
Private	19%
Health	12%
Government	12%
Other	12%
Nonprofit	10%

Psychology: A science and a profession Psychologists experiment with objects, test, and treat behavior. Here we see psychologists testing a child, recording children's behavior through a two-way mirror, and doing tests to treat therapy.

Basic research Pure science that aims to increase the scientific knowledge base.

fMRI and SPIC Images like these help neuroscientists study brain activity during disorders such as epilepsy. The top photos use fMRI technology; the second row shows SPIC technology, and the third shows how the two are combined and processed to show the differences between them.

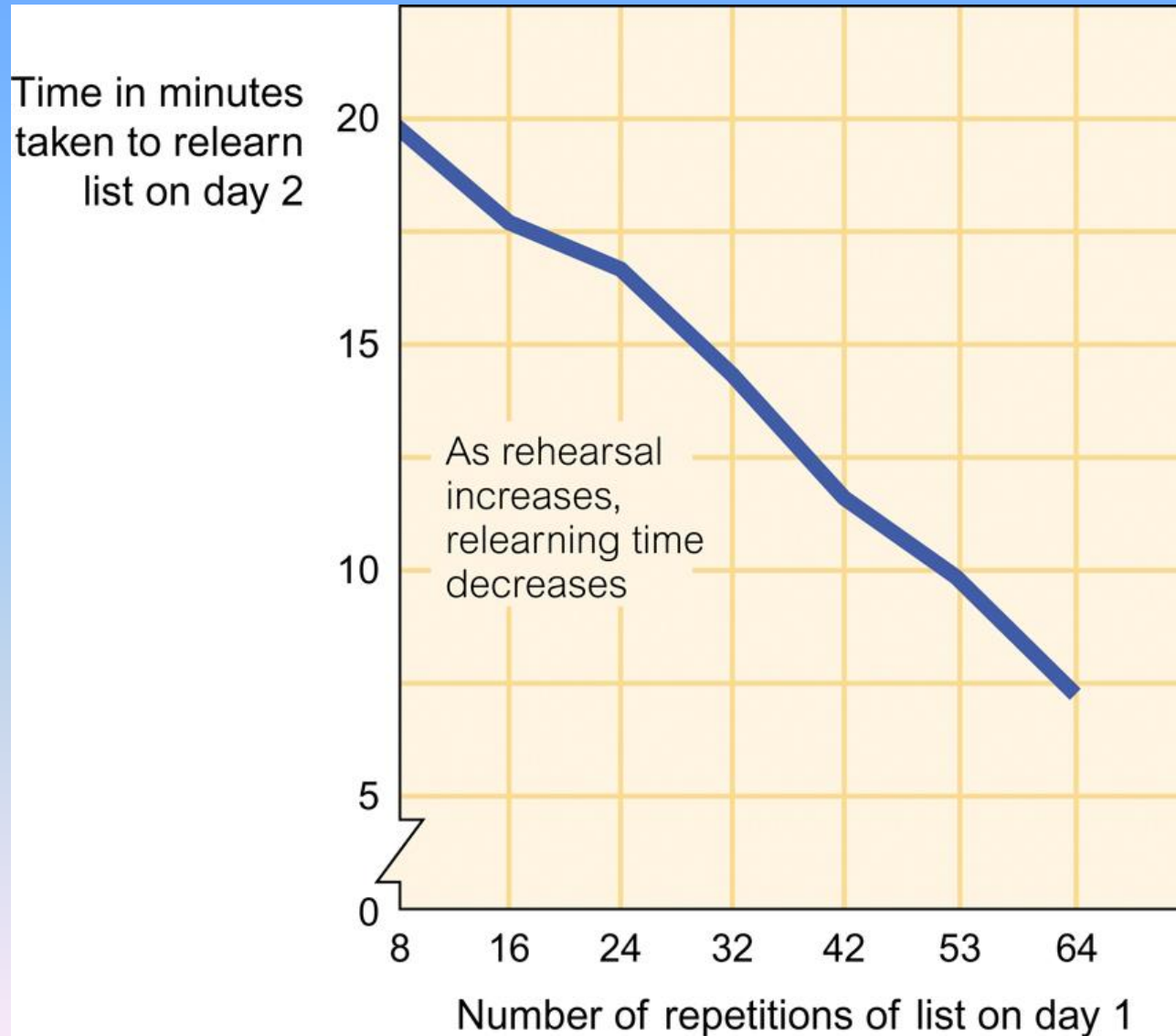
Many of those earning a doctorate in psychology become academic psychologists. These psychologists work in colleges and universities conducting **basic research** in a number of subfields. To appreciate some of their interests, consider these examples of academic psychologists and a question they might attempt to answer:

- **Neuropsychologists** (also called biological psychologists or biopsychologists) explore how the structures of the brain work to produce behaviors. Using the most advanced technology, such as single-photon emission-computed tomography (SPECT), magnetic resonance imaging (MRI), and functional MRI (fMRI), neuropsychologists often study a disorder, such as epileptic seizure, attempting to diagnose, treat, and explain how this disease disrupts normal neurological functioning. A biological psychologist might ask, "How does the brain scan of someone experiencing an epileptic seizure differ from the brain scan of someone who has not experienced a seizure?" The answers to this and similar questions help neuropsychologists search for new and improved disease treatments. Neuropsychologists work most often in university or college settings, where they teach classes and conduct research.

Rehearsal

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

Rehearsal and Retention



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

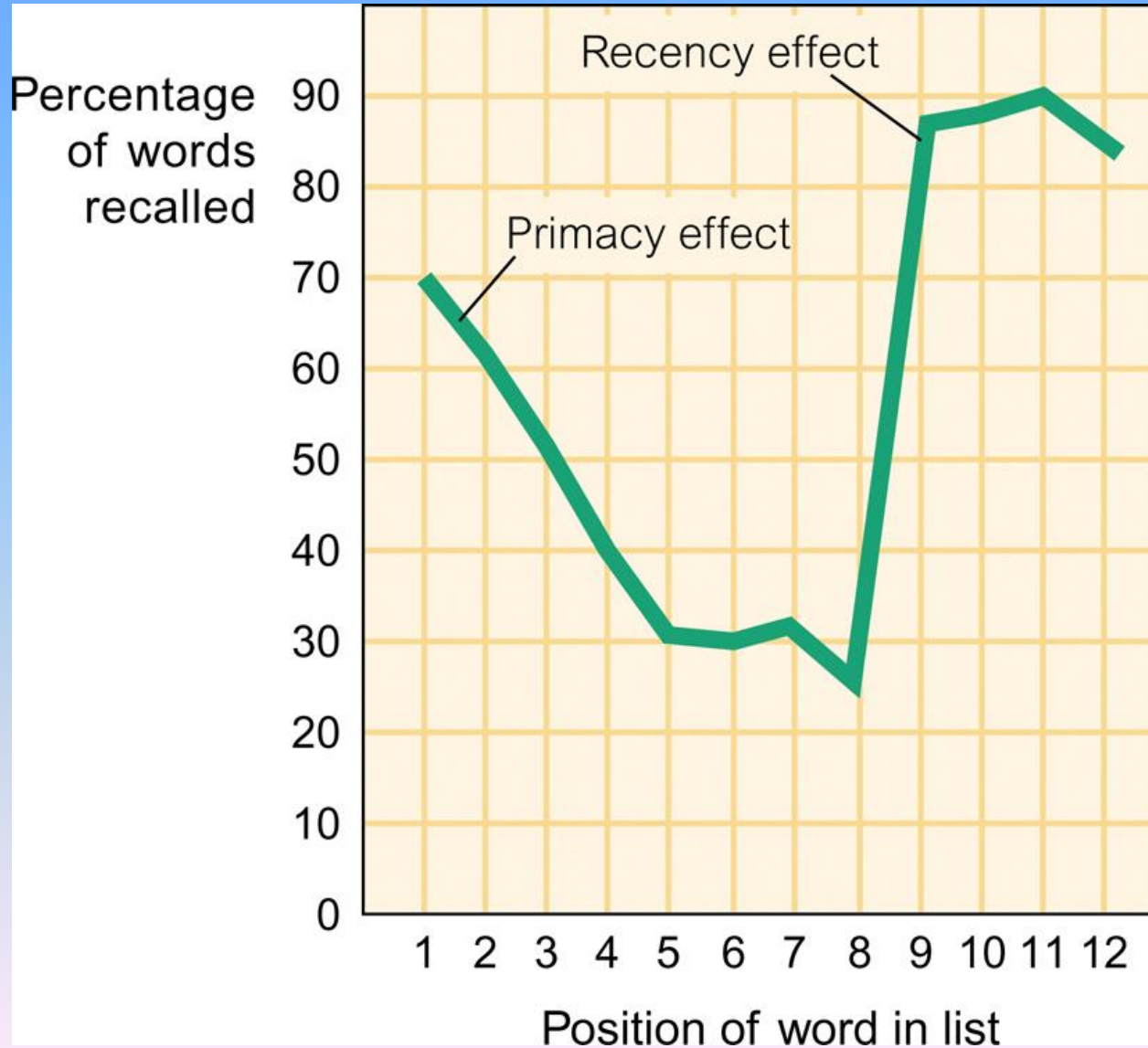
Module 22: Information Processing

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



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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

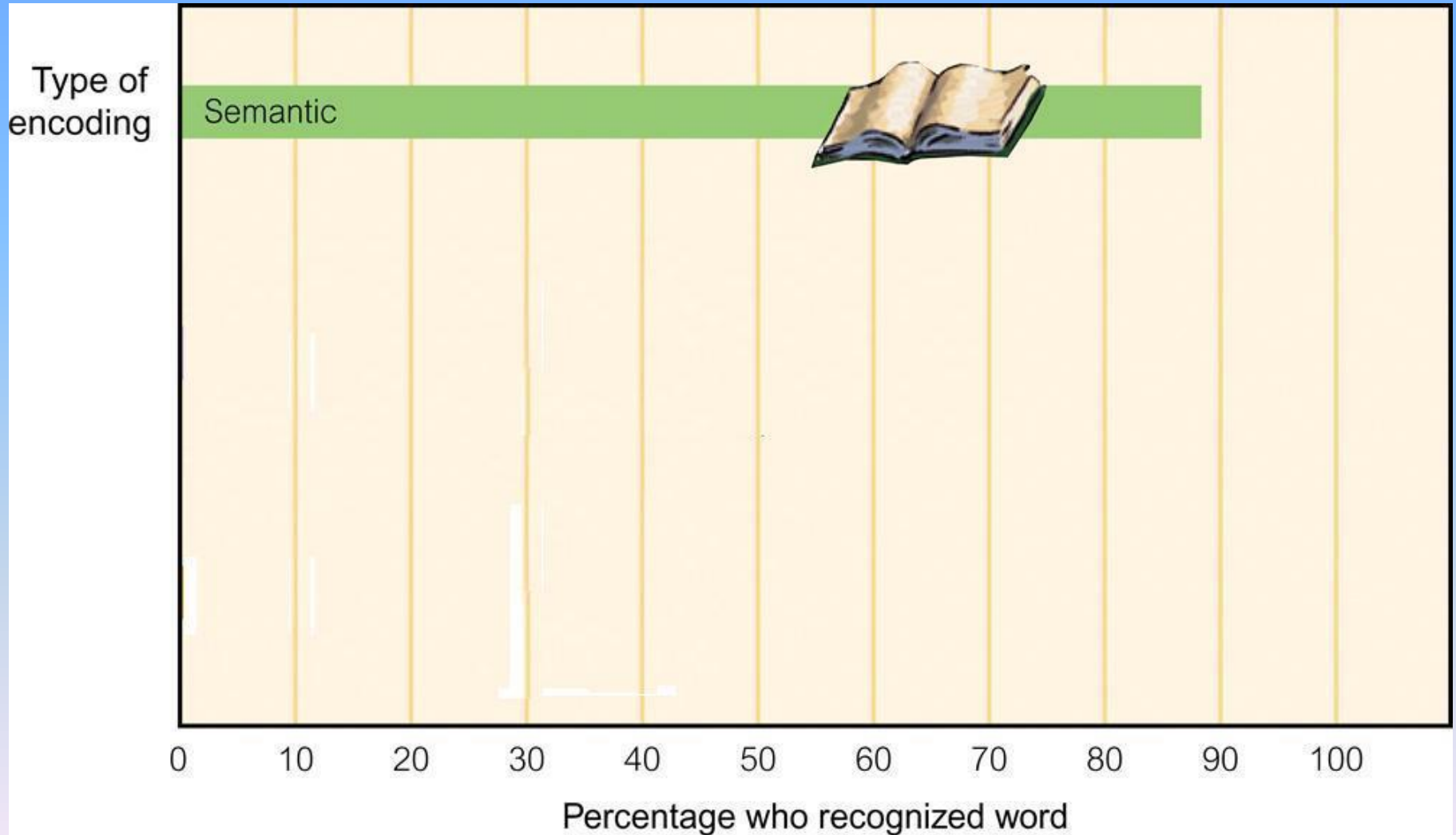
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Encoding: Encoding Meaning

Semantic Encoding

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

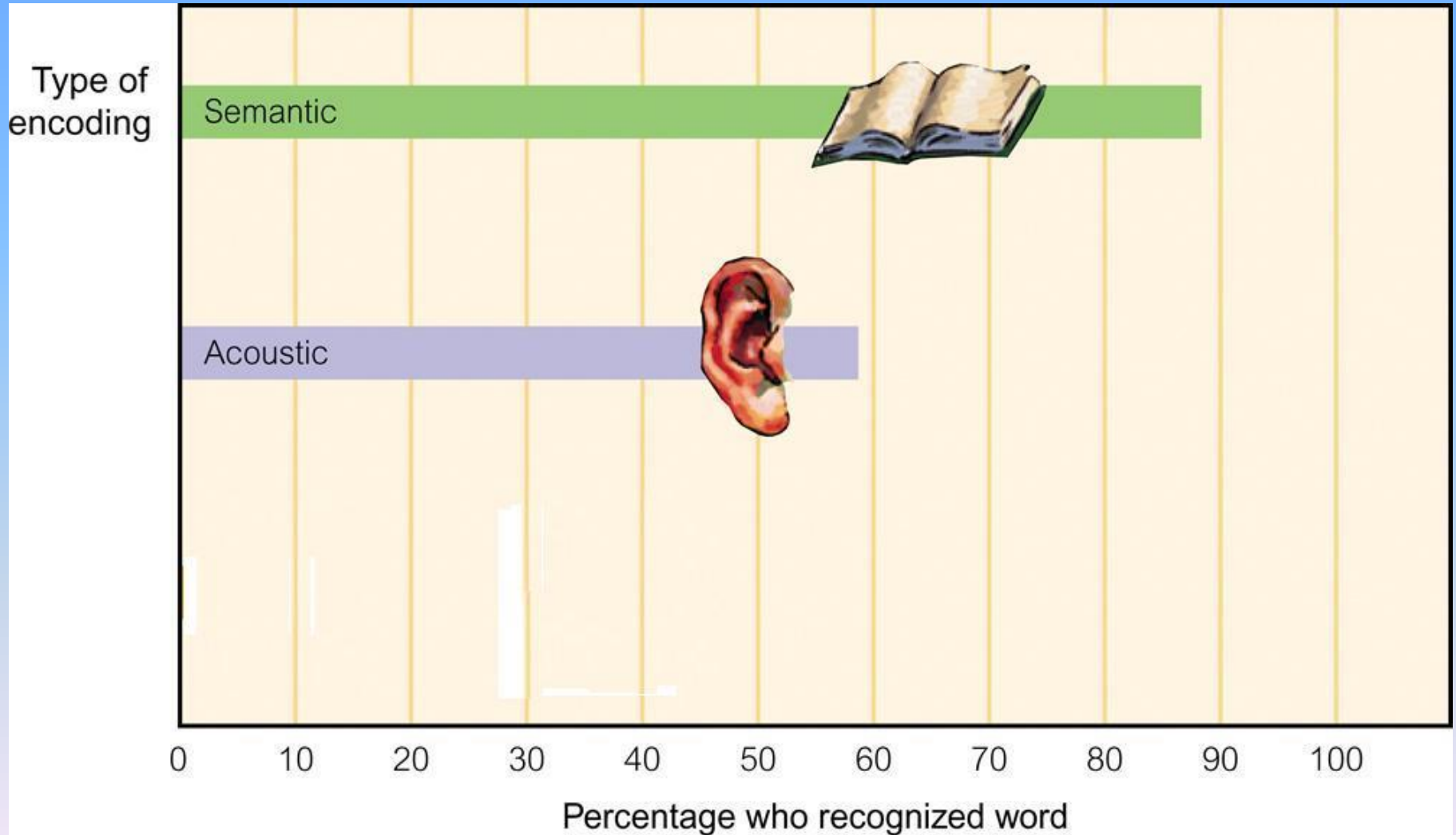
Semantic Encoding



Acoustic Encoding

- Encoding information based on the sounds of the information

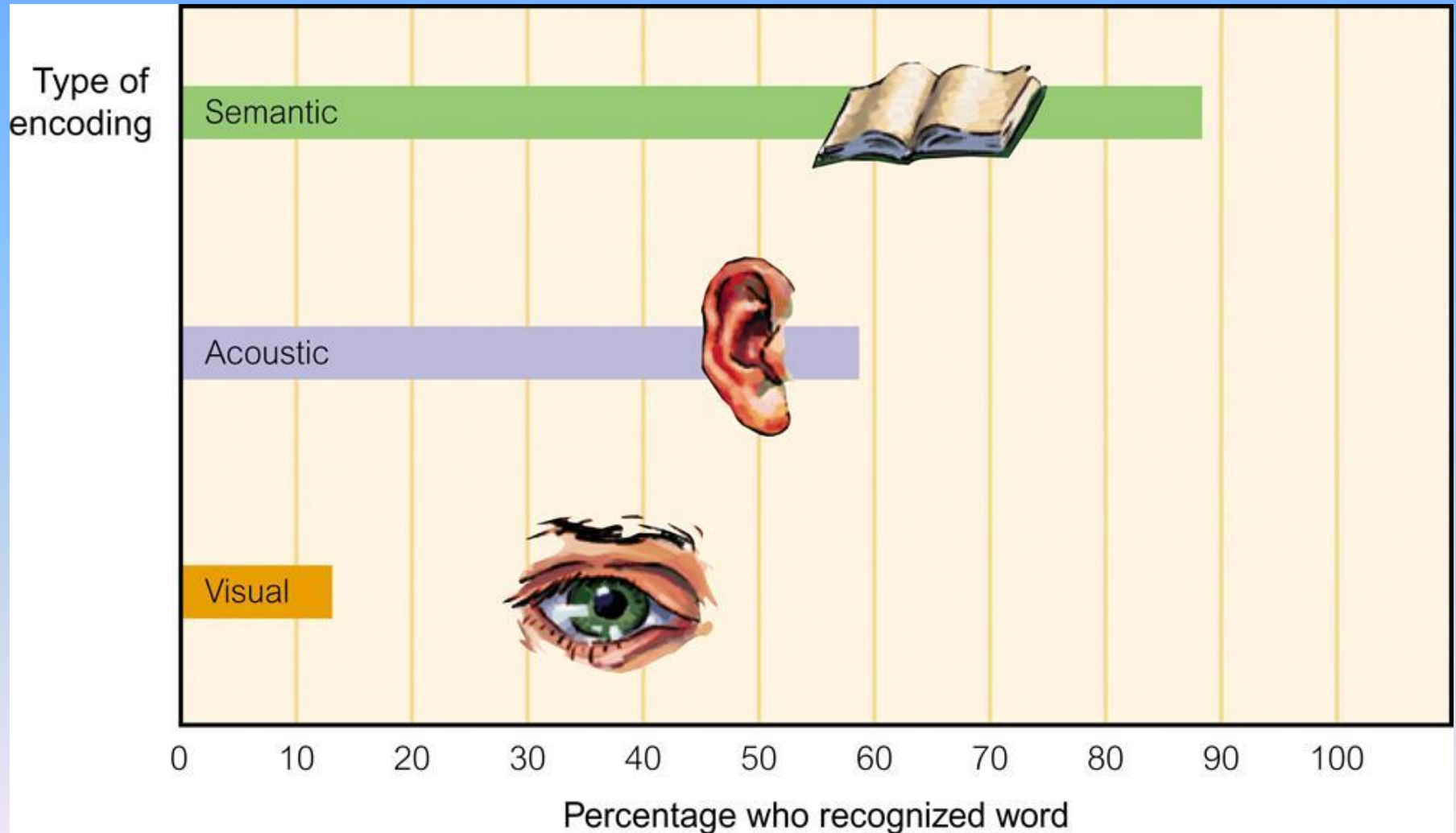
Acoustic Encoding



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

Module 22: Information Processing

Encoding: Encoding Imagery

Encoding Imagery

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



Module 22: Information Processing

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.



Module 22: Information Processing

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

Module 22: Information Processing

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

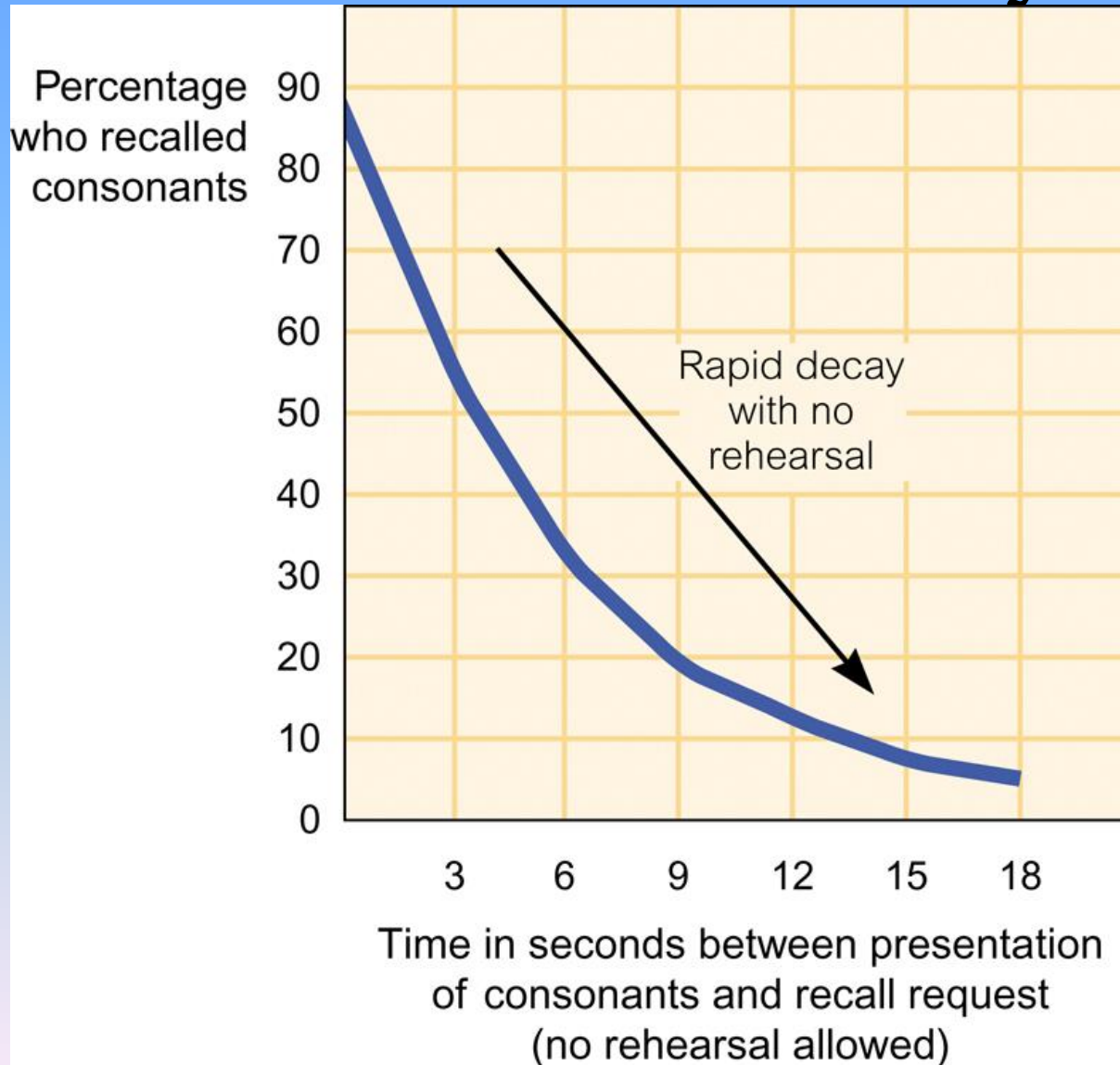
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Storage: Short-Term Memory

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



Module 22: Information Processing

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

Module 22: Information Processing

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

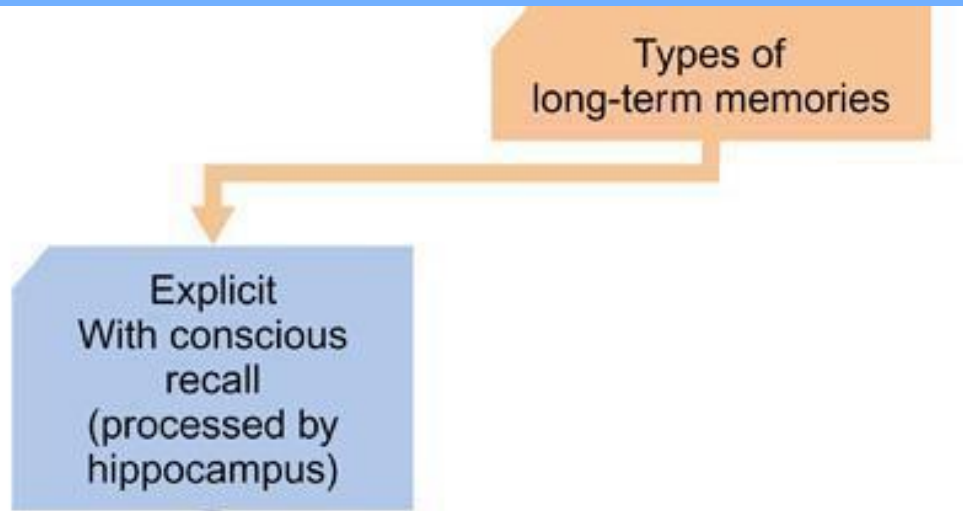
Module 22: Information Processing

Storage: Explicit and Implicit Memories

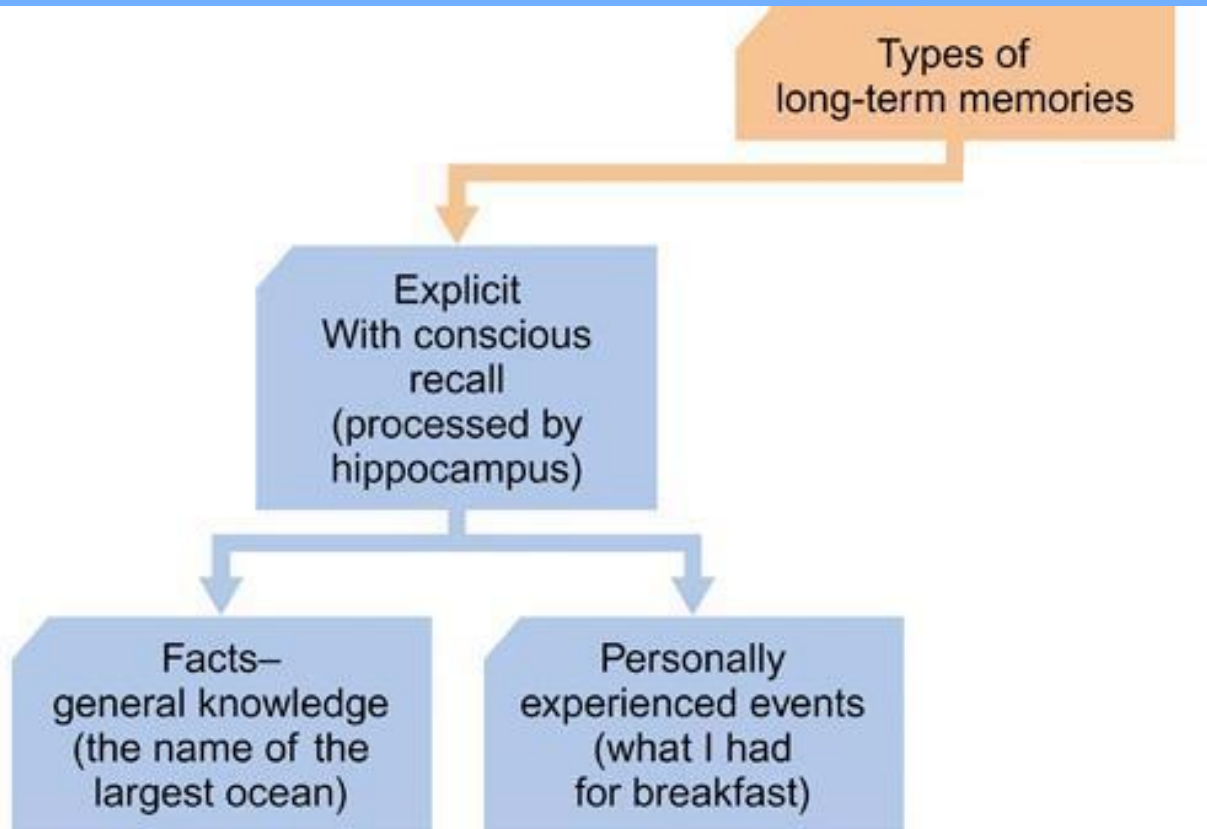
Explicit Memory

- Memory of facts and experiences
- Processed through the hippocampus

Explicit Memories



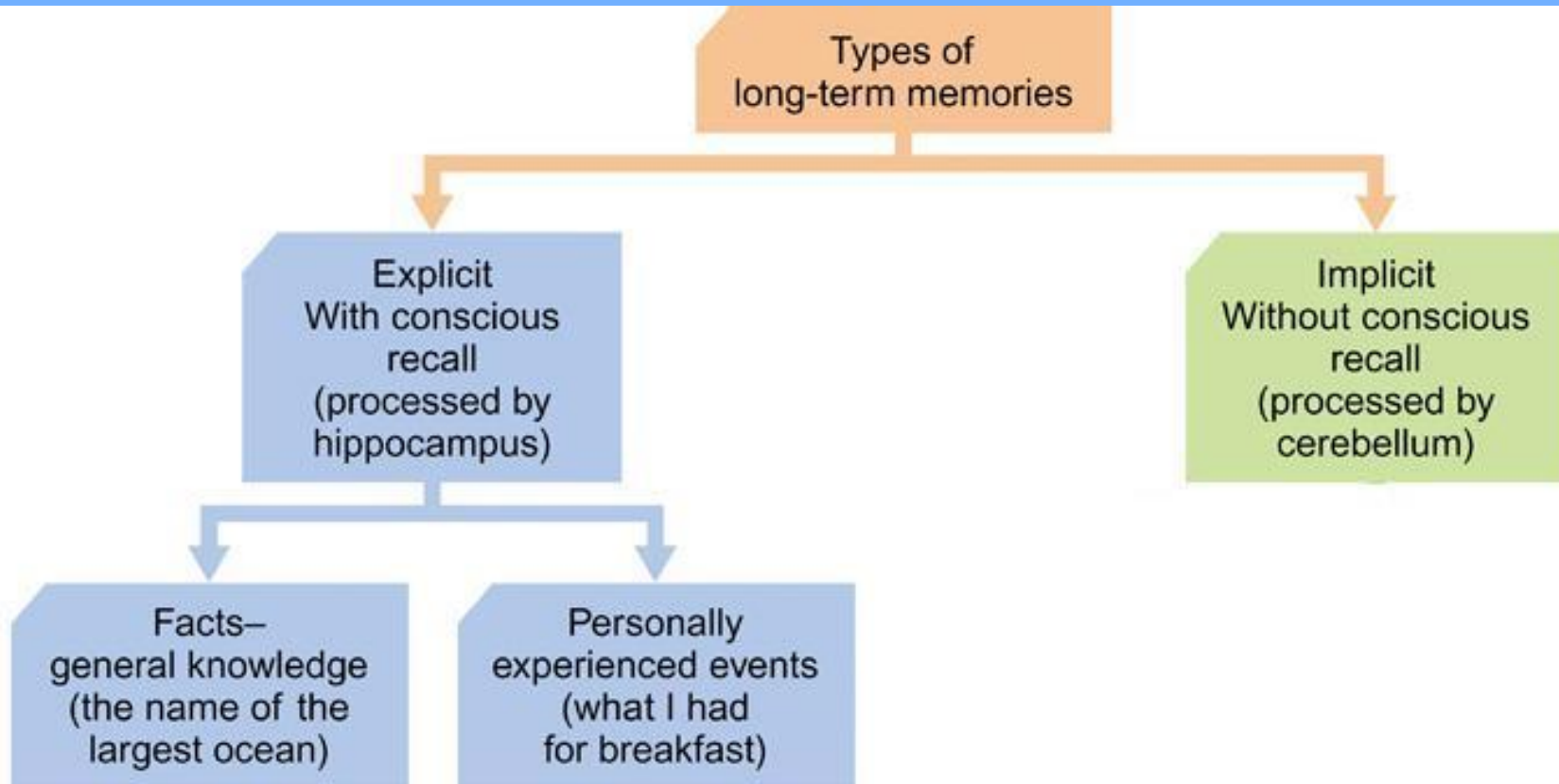
Explicit Memories



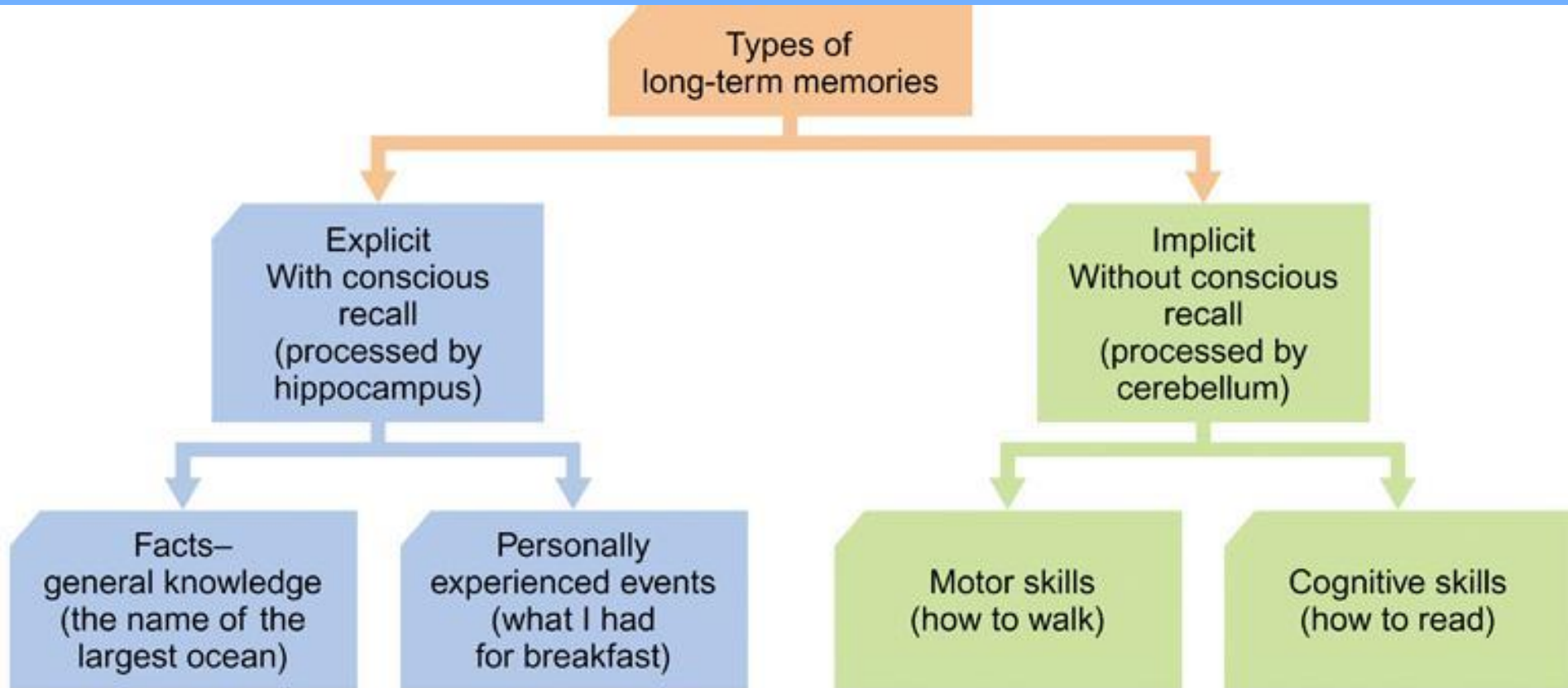
Implicit Memory

- Memory of skills and procedures
- Processed through the cerebellum

Implicit Memories



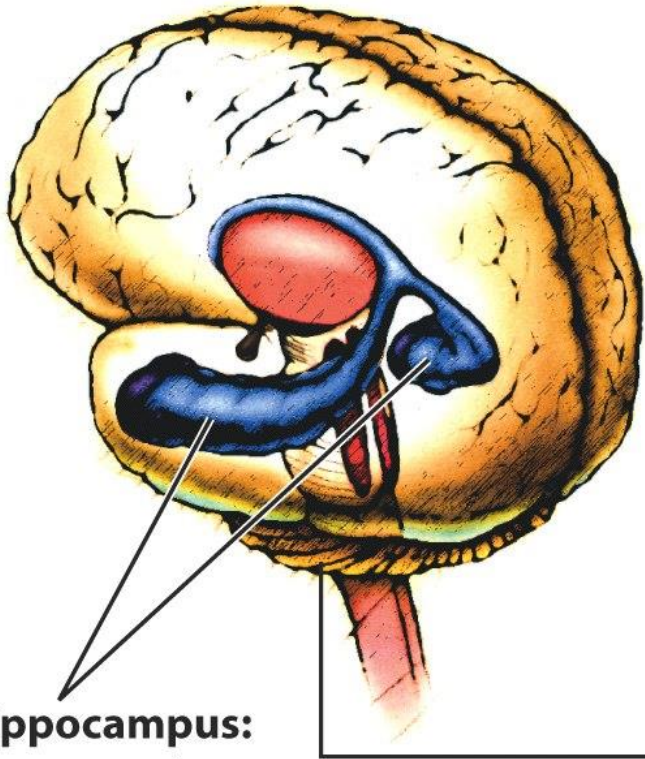
Implicit Memories



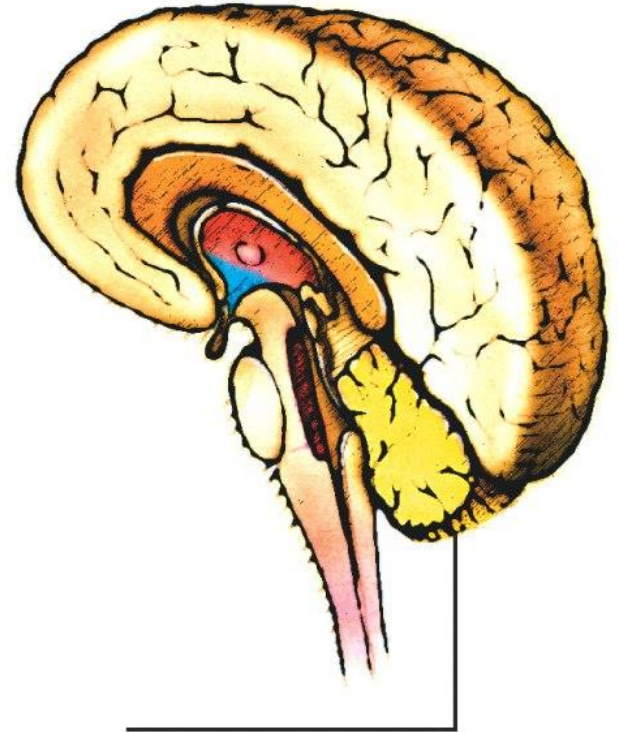
Memory and the Hippocampus

- 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"



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

Seeing or hearing the word "barber"



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

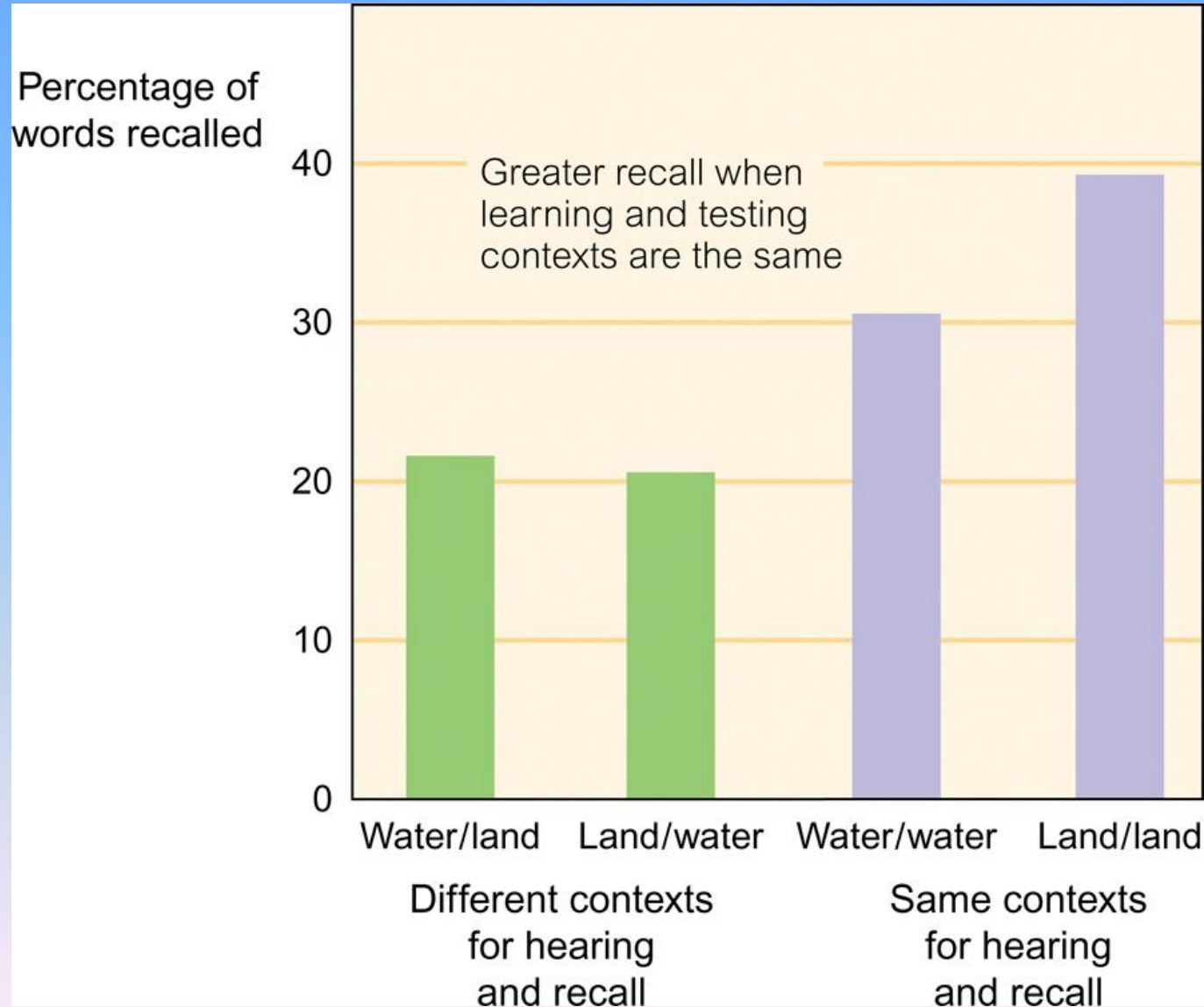
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Retrieval: Context

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



Module 22: Information Processing

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