Memory

PSY 1000:
Introduction to Psychology

Which penny is correct?

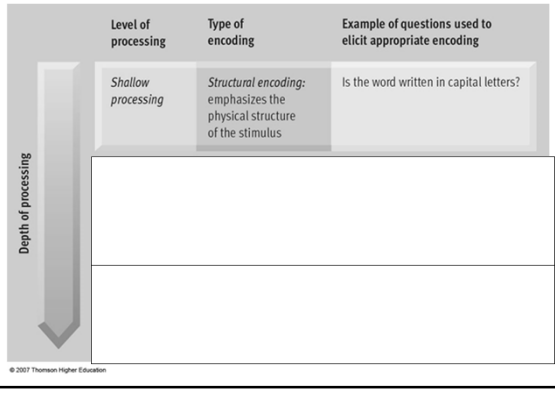
Human Memory: Basic Questions

- **Memory** is an active system that receives information from the senses, puts that information into a usable form, and organizes it as it stores it away, and then retrieves the information from storage
- How does information get into memory?
  - **Encoding**: involves forming a memory code
  - Computer analogy: entering data via keyboard
- How is information maintained in memory?
  - **Storage**: involves maintaining encoded information in memory over time
  - Computer analogy: saving data to a disk (but memories are not as unchanging as computer files)
- How is information pulled back out of memory?
  - **Retrieval**: involves recovering information from memory stores
  - Computer analogy: calling up file and displaying data on monitor

Encoding: Getting Information Into Memory

- In general, you need to pay attention to information if you intend to remember it
  - **Attention** involves focusing awareness on a narrowed range of stimuli or events
- Selective attention is critical to everyday functioning
  - Just imagine how poorly you would function if everything in your environment demanded equal attention
- Attention acts like a filter that screens out most stimuli
  - Cocktail party phenomenon
    - Divided attention impairs performance

Levels-of-Processing Theory



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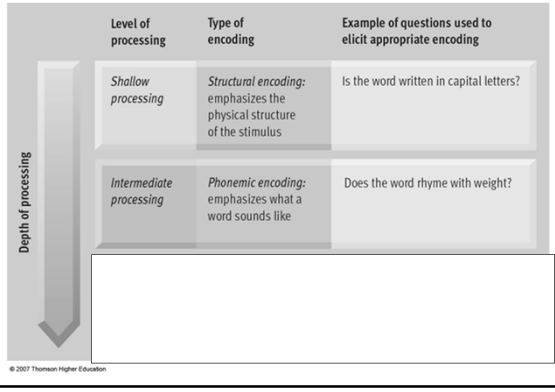

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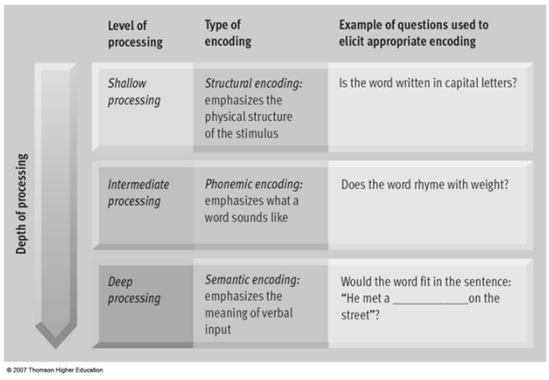
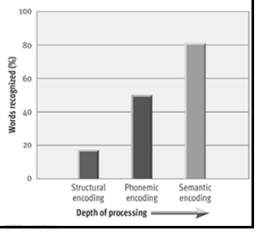


Levels of Processing: Craik and Lockhart (1972)

- Incoming information processed at different levels
- Deeper processing leads to longer lasting memory codes
- This has been replicated many times (e.g., Craik & Tulving, 1975)

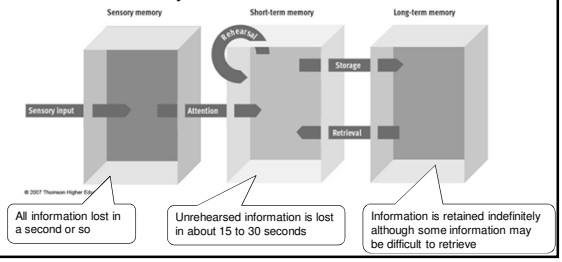


Enriching Encoding: Improving Memory

- There are other dimensions to encoding that can enrich the encoding process and improve memory
- **Elaboration** is linking a stimulus to other information at the time of encoding
  - Example: Thinking of examples
- **Visual Imagery** is the creation of visual images to represent words to be remembered
  - Easier for concrete objects
  - **Dual-coding theory** holds that memory is enhanced by forming semantic and visual codes, since either can lead to recall
- **Self-Referent Encoding** involves deciding how or whether information is personally relevant
  - Example: Making information personally meaningful

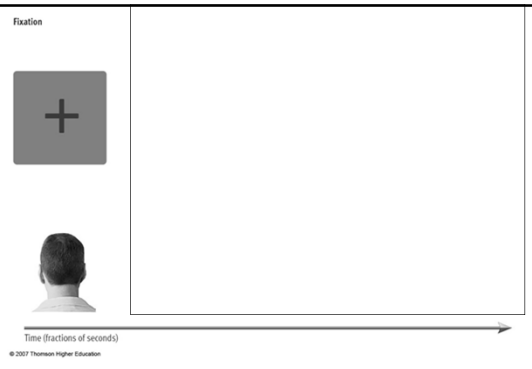
Storage: Maintaining Information in Memory

- Analogy: information storage in computers
- **Information-processing theories**
  - Subdivide memory into **3 different stores**

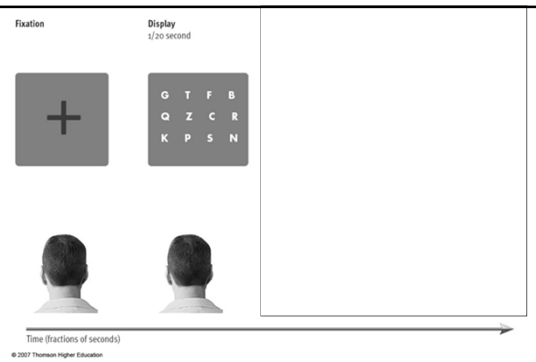


Sensory Memory

- **Sensory memory** preserves information in its original sensory form for a brief time, usually only a fraction of a second
  - Example: the afterimage created when you move a sparkler very quickly
  - Some researchers argue that sensory memory is more of an "echo" than a "memory"
- Auditory sensory memory (echoic) lasts 2-4 seconds
- Visual sensory memory (iconic) lasts approximately ¼ second
  - **George Sperling (1960)**
    - Classic experiment on **visual sensory store**



Sperling's (1960) study of sensory memory showed that memory performance decreased as the time interval increased



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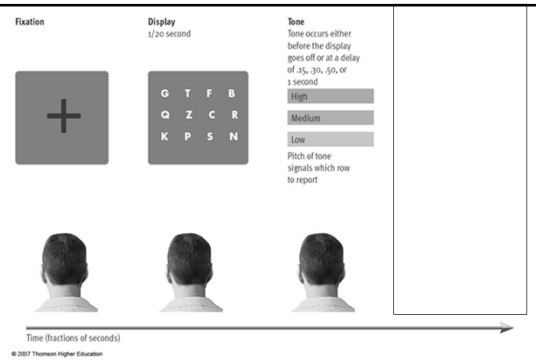

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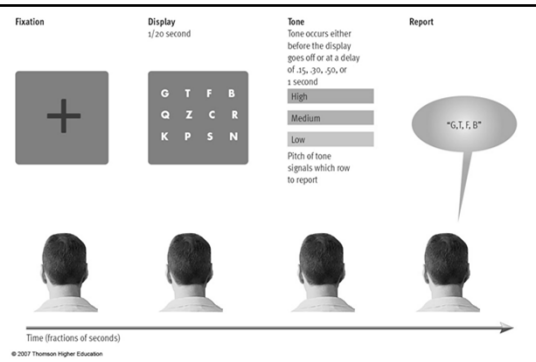

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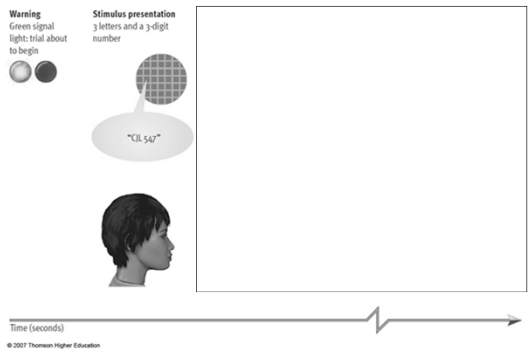
Short-Term Memory (STM)

- **Short-term memory** is a limited capacity store that can maintain unrehearsed information for up to about 20 seconds
  - Selective attention is important for moving information from sensory memory to short-term memory
  - **Limited capacity**: magical number 7 plus or minus 2
  - **Chunking**: grouping related stimuli for storage as a single unit
  - **Limited duration**: about 10-20 seconds without rehearsal
    - **Rehearsal**: the process of repetitively verbalizing or thinking about the information

Peterson and Peterson's (1959) study of short-term memory demonstrated that information in short-term memory disappears in about 10-20 seconds if it is not rehearsed



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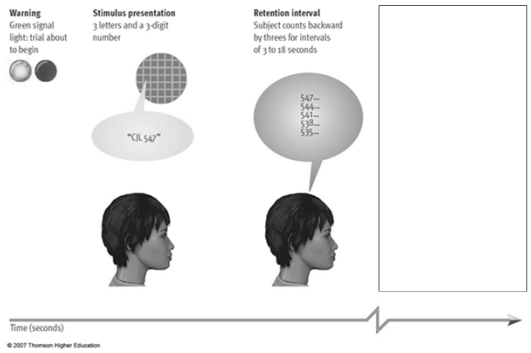

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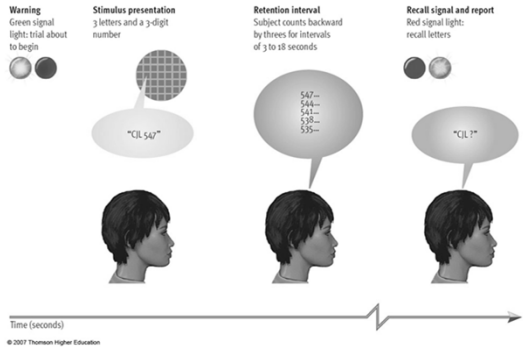

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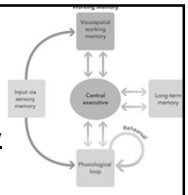
Short-Term Memory and "Working Memory"



- Short-term memory is a "place" where information is stored and **working memory** is an active system that processes the information in short-term memory
- Baddeley (2001): components of working memory
  - **Phonological rehearsal loop**: the use of recitation to maintain an object in memory
  - **Visuospatial sketchpad**: permits individuals to hold and manipulate visual images
  - **Central executive system**: controls the deployment of attention, switches the focus of attention, and divides attention as needed (it also coordinates the other modules)
  - **Episodic buffer**: a temporary, limited-capacity store that allows the various components of working memory to integrate information (and is the interface with long-term memory)

Long-Term Memory: Unlimited Capacity

- **Long-term memory** is an unlimited capacity store that can hold information over lengthy periods of time
- Permanent storage?
  - **Flashbulb memories**: unusually vivid and detailed recollections of momentous events
  - Memory is more malleable and less accurate than generally appreciated
- Debate: are short-term memory and long-term memory really different?
  - Some researchers argue that there may only be one "generic" memory store or that short-term memory is a specialized form of long-term memory occurring in a heightened state of activation

Types of Long-Term Memories

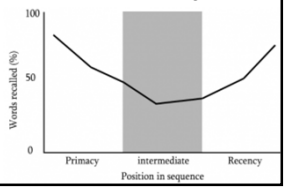
- **Declarative vs. Procedural**
  - **Declarative memory system** handles factual information
  - **Procedural memory system** houses memory for actions, skills, conditioned responses, and emotional responses
- **Types of Declarative Memory: Semantic vs. Episodic**
  - **Semantic memory system** contains general knowledge that is not tied to the time when the information was learned (e.g., I know that my taxes are due on April 15th each year)
  - **Episodic memory system** is made up of chronological, or temporally dated, recollections of personal experiences (e.g., I remember working in my yard last Saturday)
- **Prospective vs. Retrospective**
  - **Prospective memory** involves remembering to perform actions in the future (e.g., I need to walk the dog when I get home this evening)
  - **Retrospective memory** involves remembering events from the past or previously learned information (e.g., who won the World Series last year?)

Retrieval: Getting Information Out of Memory

- Encoding and storing information is pointless if you are unable to get the information out of memory when you need it
- **Tip-of-the-tongue phenomenon**: the temporary inability to remember something you know, accompanied by a feeling that it is just out of reach
- **Retrieval cues**: stimuli that help gain access to memories
  - Context cues: using the context of an event to stimulate its retrieval
- Reconstructing memories
  - Our memories are not "mental videotapes"…rather they are sketchy reconstructions
  - Video
  - **Misinformation effect**: the recall of an event is altered by introducing misleading postevent information ("How fast were the cars going when they ***hit*** each other?" vs. "How fast were the cars going when they ***smashed*** into each other?")
  - **Source monitoring**: making attributions about the origins of memories (e.g., remembering where you heard about the misinformation effect)
  - **Reality monitoring**: deciding whether memories are based on external sources (e.g., actual events) or internal sources (e.g., thoughts, imagination, dreams)

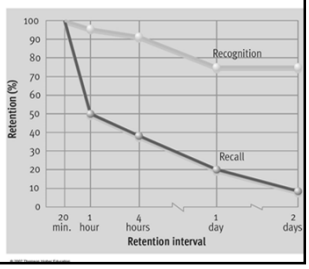
Primacy and Recency Effects

- **Serial position effect** refers to variations in memory for items in different positions
  - We have the best memory for items at the beginning and end of lists
- **Primacy effect** is our tendency to have the best memory for items at the beginning of a list because there is nothing to interfere with their rehearsal
- **Recency effect** is our tendency to remember information at the end of a list because it is still in short-term memory



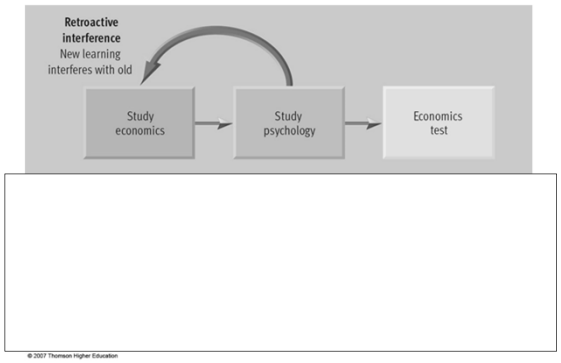
Forgetting: When Memory Lapses

- Retention refers to the proportion of material retained (or remembered)
  - **Recognition**: select previously learned information from an array of options
  - **Recall**: reproduce information on their own without any cues

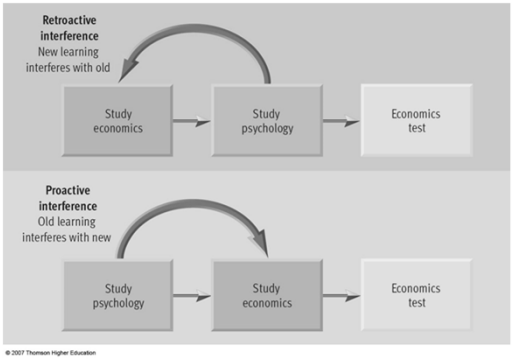


Why Do We Forget?

- **Ineffective Encoding**
  - Example: Being distracted while reading chapter 8
  - **Pseudoforgetting**: information was never inserted into memory
- **Decay theory**: forgetting occurs because memory traces fade with time
  - …although time appears to be important, **interference** also appears to play a vital role
- **Interference theory**: people forget information because of competition from other material
  - Retroactive
  - Proactive



Retroactive and proactive interference



Retroactive and proactive interference

Why Do We Forget?

- **Motivated forgetting**: the tendency to forget things that we do not want to remember or think about
  - **Repression**: keeps distressing thoughts/feelings buried in the unconscious
  - Recovery of repressed memories (e.g., childhood abuse)

The Anatomy of Memory

- **Retrograde amnesia** involves the loss of memories for events that occur prior to the onset of amnesia
  - Example: if I sustained a head trauma right now and forgot the previous three years of my life
- **Anterograde amnesia** involves the loss of memories for events that occur after the onset of amnesia
  - Example: "Memento"
  - H.M. is a patient who had brain surgery in 1953 to deal with debilitating epileptic seizures (i.e., his hippocampus was removed) …but he also lost the ability to form new memories