Memory and Cognition

Exam 1 Study Guide

Overview of Cognitive Psychology

❖ **What is Cognitive Psychology?**
  ➢ **Definition** – Cognitive psychology is the scientific study of the mind, of mental processes and mental structures. It is concerned with:
    ▪ How we attend to and gain information about the world
    ▪ How that information is stored and processed by the brain
    ▪ How do we solve problems and communicate?
  ➢ **Includes:**
    ▪ **Cognitive Neuroscience** – Cognitive psychologists, scientists to explain new findings
    ▪ **Sensation and Perception** – How do we pick up information from the environment and what happens with that information?
    ▪ **Pattern Recognition** – How do we perceive the world? We see the world holistically, rather than the wood and nails for example.
    ▪ **Attention** – Multitasking doesn't really work
    ▪ **Consciousness** – Actually paying attention in class or day dreaming in class.
    ▪ **Memory** – STM v. LTM
    ▪ **Imagery** – Internal maps
    ▪ **Language**
    ▪ **Thinking and Problem Solving** – Higher level skills

❖ **Why do we study Cognitive Psychology?**
  ➢ Intellectual curiosity
  ➢ It has implications on the clinical field
  ➢ Practical Applications – Psychology and the law-eye witness testimony

❖ **Importance of Studying Memory**
  ➢ **False Beliefs** – Hypnosis cannot actually recover lost memories (if you can't remember now you will not regain it); photographic memory is so rare that most researchers do not believe it exists.
  ➢ Once you describe the experiment to you, can the experiment apply to the real world? Also called ecological validity.

❖ **Memory Metaphors**
  ➢ Plato compared memory to making a seal on wax. The strength of your memory is dependent on age, character of the person, impression, etc.
  ➢ Memory compared to a cows digestive system
    ▪ The passage of memory is compared to the passage of food through the stomach of a cow. Food for thought, digesting information, etc. Does that make a connection? Does that ring a bell? 1950s or so

History of Cognitive Psychology

❖ **Early History**
  ➢ **Empiricism** – All knowledge comes from experience
  ➢ **Nativism** – Children are born with innate knowledge
  ➢ Neither of the two above can be proven

❖ **Behaviorism**
  ➢ In the 1920s there was a shift towards behaviorism
  ➢ New generation of psychologists
    ▪ Rejected introspection
    ▪ Focused on the outward behavior and what can be observed
    ▪ This behaviorism trend went too far and thus started the Cognitive Revolution

❖ **Cognitive Revolution**
  ➢ Understand human intelligence and how it works
  ➢ Operant and Classical Conditioning

Important People and Times

❖ **Hermann Ebbinghaus**
  ➢ First major scientific researcher of memory
  ➢ Interested in the formation of new associations. In short he wanted to find the link between concepts such as grass being associated with green. He used nonsense syllables (LUP, WAB, etc) to see how people learn associations.
    ▪ **Procedures**
      • 1) Learned a list of nonsense syllables for serial recall test (Recall in the correct order of presentation)
      • 2) Varied the retention interval from hours to months
      • 3) Relearned the list to then calculate the timesaving's. By doing this he was able to define memory retention.
  ➢ **Principles Hermann Ebbinhaus Found**
    ▪ The more time he spent the more he remembered
    ▪ **Forgetting Function**
      • By varying the time interval between studying and the serial recall test he was able to predict how quickly one forgets information. Most of the information is forgotten immediately after you learn it. After the immediate loss the rate of forgetting flattens out.

- ❖ **Wilhelm Wundt**
  - ➢ **Introspection** – Looking inward
  - ➢ First lab founded in 1879, the birth date of psychology
  - ➢ Free association task
- ❖ **William James**
  - ➢ Involved <u>functions of our thoughts, functions, and feelings</u>
  - ➢ Believed that consciousness served as a function – planning for the future
  - ➢ **Primary Memory**
    - ▪ Everything that you are currently aware or is in your consciousness of is what we call Short-Term Memory.
    - ▪ It is very easily able to be distracted
  - ➢ **Secondary Memory**
    - ▪ Everything you know but that which you're not necessarily thinking about at that moment. Much more permanent and it's much harder to be disrupted, also called Long-Term Memory

<p align="center">Models</p>

- ❖ **Modal Model (Atkinson & Shiffrin, 1968)**
  - ➢ **Assumptions**
    - ▪ Consists of a series of sequential stages
    - ▪ Each stage receives information from preceding stage and then performs its unique function
  - ➢ **Structures**
    - ▪ **Sensory Memory**
      - • Very brief memory system that holds everything that hits your senses. It may or may not be processed for memory.
      - • **Iconic Memory** – Everything you see enters your iconic memory.
      - • **Echoic Memory** – Everything you hear enters your echoic memory.
    - ▪ **Short-Term Memory**
      - • Temporary storage system. Fairly limited capacity, short duration. You can keep information in your STM by refreshing it (repeating a phone number to yourself).
    - ▪ **Long-Term Memory**
      - • Our relatively permanent, long-lasting, memory store. Essentially unlimited.
  - ➢ How information flows through the system (control processes)
    - ▪ Rehearsal
    - ▪ Encoding
    - ▪ Retrieval
      - • Information is copied back into short-term memory. Tip of the tongue phenomenon is the sensation when we have you know a word that you're searching for, but you cannot retrieve (recall) the whole word (but some) of it from your LTM.

- ➢ **Support for Modal Model**
  - ▪ **Serial Position Effects**
    - • **Primary Effect**
      - ♦ You can recall the first few items of the list (since you rehearse them). By the time you get to the 7th word something has to go, you're less likely to remember the items in the middle most. Occurs because of LTM.
    - • **Recency Effect**
      - ♦ You can recall the last few words as long as you don't have a distractor. STM is responsible for recency effect.
  - ▪ **Types of errors in recall**
    - • If you make a mistake when recalling information, the mistakes tend to be very different whether or not the information comes from your STM or LTM.
    - • If you are presented a list of homophones visually (Hare, Ferry, etc) and then asked to recall it 20 seconds later (STM) then you're likely to be based on sound (hair, fairy, etc)
    - • If you are asked to do it after 5 minutes later it's based on semantics (Rabbit, boat, etc)
  - ▪ **Anterograde Amnesia (Inability to form new memories)**
    - • H.M. Suffered from fairly severe epileptic seizures. They always started in his hippocampus, he probably would not of survived them had they not of removed his hippocampus. He didn't have any more seizures, but he couldn't form new memories. He shows recency effect but NO primacy effect.

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Sensory Information Processing

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- ❖ **Perception**
  - ➢ **Definition** - The process of interpreting information from stimuli.
  - ➢ What hits your retina is sensation, perception is what you do with it (young woman vs. old woman)

- ❖ **Overview of Sensory Information Processing**
  - ➢ **Stimulus Energy** – e.g. light waves leading to vision, vibration in the air that leads to sound, etc. Some sort of physical energy
  - ➢ **Transduction** – Taking that raw physical energy and converting it to electrical activity.
  - ➢ **Sensory Stores** - Iconic / Echoic Storage
  - ➢ Selection for recording and further processing
    - ▪ Some, but not all is sent for recording

- ❖ **Sensory Stores**
  - ➢ Functions of Sensory Memory

- ➢ Characteristics of Sensory Memory
  - ▪ **Veridical Form** – It should be real and accurate
  - ▪ **Relatively Large**
  - ▪ **Brief Period of Time** – Since it stores everything, and we're continually receiving new information, then it must erase quickly to avoid superimposing on the next image. Lasts only 250ms

❖ Iconic Memory
- ➢ Sperling (1960)
  - ▪ Sperling's work demonstrates the capacity and duration of storage
  - ▪ Flashed 9 or 12 letters at 50ms, also known as full report or partial report. All of 9 or 12 letters enter iconic memory, but they just fade very quickly. Subjects do not know ahead of time what line they're going to recall. Partial reports can be considered much the same way exams are done since you aren't tested over everything. As long as he presented the cue within 250ms they had no problem identifying that row, after 250ms it was gone.
- ➢ **Backwards masking**
  - ▪ The underlined word you can recall, the circle say over the X replaces the memory so it removes memory from before.
- ➢ **Is iconic store simply a visual afterimage?**
  - ▪ Some have argued it's not a memory system, it's a visual afterimage. If you stare at something red, the afterimage is green. If blue, it's yellow. If it's really an afterimage we should see the same colors, not a complementary color. It truly is a memory system, not an afterimage. Dyslexic children see the exact same letters other children do, they just differ on how to process it from their sensory store.

❖ Echoic Memory
- ➢ **Three-eared man experiment**
  - ▪ Presented 3 numbers on each ear
  - ▪ If asked during a full report, they can do 3-4 numbers. If asked during a partial report, they can almost always get the three numbers correct.
- ➢ Stores about 3-4 seconds
- ➢ **Modality Effect -** The last few items in the list are recalled better if the list is presented in an auditory fashion, rather than visually.
- ➢ **Suffix Effect** - By getting a suffix, but not having to remember it, you are less likely to remember the words in the group.

Types of Processing / Recognition

❖ Pattern Recognition
- ➢ Theories of Object Recognition
  - ▪ **Template Matching**

- A type of hypothetical structure that are represented as an internal pattern in your LTM. It's a very inflexible model; this theory states that you'd have to have a model for everything.
  - **Feature Analysis**
    - Two slanted lines and a connecting bar represent the letter A.
    - This reduces our load on our LTM, much less time consuming

- ❖ **Bottom-up Processing vs. Top-down Processing**
  - ➤ **Bottom-up processing (Data-driven processing)** – Processing is driven by the stimulus pattern
  - ➤ **Top-down processing (Conceptually-driven processing)** – Context and higher-level knowledge influence lower level processes. The fact you can replace every third letter with an x or rearrange the letters you can still read it. This explains why typos, in your own work, are so difficult to catch.
  - ➤ **Word Superiority Effect** – Letters that are in the context of a word is easier to detect than non-words. The flashing of WBKX (bottom-up) and JOKE (top-down + bottom-up) example in class.
  - ➤ **Phoneme Restoration Effect** – A tape-recorded sentence is played with a phoneme (smallest unit of sound) is deleted and white noise is substituted in its place. What you hear is dependent on the context of that sentence.

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Attention

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- ❖ **Selective Attention**
  - ➤ <u>You are only aware of a small portion of what hits you.</u>
  - ➤ Through the process of pattern recognition, you take info from the sensory memory store and put it towards a meaning. When does that occur? Before or after selective attention? Do you chose what you want to pay attention to, then through pattern recognition it's assigned meaning or does pattern recognition occur first?
  - ➤ **Auditory Attention**
    - **Dichotic Listening Task -** Listening to only your right ear when you're being spoken to in both ears. You'll not know anything from the ignored ear
- ❖ **Theories of Selective Attention**
  - ➤ **Early-Selection Filter Models**
    - *Broadbent's Filter Theory*
      - Using a factory as an analogy with two different production line, but there's only one inspector that must inspect every item. The bottleneck is the inspector. In order to do this you must close off one side of production to get one line through. Attention plays the role as a "gate" mechanism. Say you're only listening to the right ear, the right ear is assigned meaning, and the other ear that's blocked off rapidly fades away and never gets processed for meaning whatsoever.

- *Evidence for:*
  - ◆ *Broadbent (1954) what?*
- **Problems for Broadbent's Theory**
  - ◆ **Gray and Wedderburn (1960)**
    - ➢ Shadow (dog, 6, fleas) ignore (8, scratch, 2). When asked to shadow one ear, because of the flip-flops of words and numbers it stops the effect. They have no trouble getting information from the unattended ear.
  - ◆ **Cocktail Party Effect**
    - ➢ If your name is presented in the ignored ear, often times then people are able to identify it. It will then disrupt their ability to shadow the other ear. Attention is not a firm gate like Broadbent said, it acts more like a volume control. You are able to turn down the unattended stimulus.
- **Triesman's Attenuation Model**
  - It is still considered early-selection, but more flexible than Broadbent's theory. It allows for processing of more than one stimulus at a time. It does not allow for any long-term effects of that information, you should only be affected by the information that you are consciously aware of. The information you're not consciously aware of should fade away.
- ➢ **Late-Selection Filter Models**
  - Every single thing that hits your senses is processed for meaning, and then you chose what you want to pay attention to.
  - Evidence for:
    - **Subliminal Semantic Priming**
      - ◆ **Lexical Decision Task** – Given a sequence of letters, decide as quickly as possible if those letters make up a word. If the "priming" word is semantically related then it's faster (Doctor -> Train is slower than Doctor -> Nurse). It hits your sensory store, assigning it meaning, and before you even recognize it.
- ➢ **Homophone Priming**
  - Individuals were given semantically related words in the ignored ear (rabbit & hare and window & pane).
  - They're given either a recognition test or spelling test.
  - Recognition – (table, hare, cat, pillow, pane, tape) identify the words you were exposed to
  - Spelling – Spell "hare" or "pane" they'll spell it "hair" or "pain"
- ➢ **Lackner and Garrett (1972)**
  - Shadow - The boys threw stones at the bank
  - Ignore – Money or river
  - Depending on whether they remember money or river, they'd say they threw it at the bank building (money) or river bank (river)

- It's as if anything someone says to whoever it can effect their behavior, this proves that subliminal messages work
- We only can be affected on subliminal messages, but only on a very short basis and simple judgments.
- ➢ The theory in the end is that selective attention is flexible. Selective attention is easier if the two messages are very different.
- ➢ **Visual Attention**
  - **Selective Looking Studies**
    - We can only process a limited amount of information in our visual field.
  - **Visual Neglect (left side neglect) Disorder**
    - Disruption in spatial awareness, they're unable to focus on their left hand side due to a stroke or other issue. They might just shave the right side of their face; or they might deny ownership of their arm or leg.
- ➢ **Capacity Model of Attention**
  - We have a limited ability to deal with multiple sources.
  - The ability to do multiple things together you have to break it down to % of cognitive resources being used. **Attention is the process of allocating these resources to various activities.**
  - Secondary Task Technique (Divided Attention Task)
    - Primary Task, Secondary Task
    - You're simply asked to do two things simultaneously. They're told to perform some activity, often times they're given the impression the primary task is the most important part of the experiment. In addition to engaging in the primary task you must do a secondary task at the same time. Your performance is actually based on the secondary tasks performance.
    - Primary Task – Anagrams, croodt (doctor - hard) vs. dortoc (doctor - easy)
    - In addition to solving these puzzles, you're asked to hit a button as quickly as possible every time you hear a tone in the background. The speed of the response is used to measure how much capacity you need for the anagram task.
  - **Attributes of Automatic Processes**
    - Occurs without intention
    - Not available for conscious monitoring
    - Consume few, if any additional resources
  - **Stroop Effect**
    - Naming the ink color of a word that spells out another color is VERY difficult. You can't not read.
  - **Development of Automaticity**
    - They occur without intention (involuntary). You are not aware of identifying the word "red", only the end product.
  - **Disadvantages of Automatic Processing**

- Any time you are confronted with change, relearning must take place.

Definitions

Cognitive Psychology - Cognitive psychology is the scientific study of the mind, of mental processes and mental structures.

Forgetting Function – Most of the information you learn is going to be forgotten immediately after learning.

Introspection - Observation of one's mental state. Looking inward

Primary Memory – Also known as STM

Secondary Memory – Also known as LTM

Sensory Memory – Includes your iconic and echoic memory

Iconic Memory – Visual memory store, lasts 250ms. 4-5 item max

Echoic Memory – Auditory memory store, (3 or 4 seconds)

Primacy Effect – You can recall the first few items in a list

Recency Effect – You can recall the lasts few words as long as you do not have a distractor

Anterograde Amnesia – Inability to form new memories

Sensation – a physical condition or experience resulting from the stimulation of one of the sense organs

Perception – The process of interpreting information from stimuli.

Template Matching (Object Recognition) – A hypothetical structure that are represented as internal patterns in your LTM. This theory states you must have a model for everything.

Feature Analysis (Object Recognition) – Two slanted lines and a connecting bar represent "A", this reduces load on our LTM and much less time consuming.

Attention – The process of allocating resources to each activity.

Stimulus Energy – e.g. light waves leading to vision, vibration in the air that leads to sound, etc. Some physical energy

Transduction – Taking that raw physical energy and converting it to electrical activity.

Modality Effect - The last few items in the list are recalled better if the list is presented in an auditory fashion, rather than visually.

Suffix Effect - By getting a suffix, but not having to remember it, you are less likely to remember the words in the group.

Declarative Memories – Memories that are easy for a person to articulate and talk about.

Non-Declarative Memories – Info in LTM that is hard to articulate but still has profound influence on our lives. i.e. Riding a bike

Memory – Location where info is kept, refers to the thing that holds the contents of experience as an engram, mental process used to learn, store, and retrieve info.

Learning – Any change in the potential of people to alter their behavior as a consequence of experience.

Distributed Practice – Memory is better when practice is spread out over time.

Massed Practice – Memory practiced lumped together.
Overlearning – Process where a person continues to study information after perfect recall has been achieved, insulates a person against forgetting.
Gestalt Movement – Idea that memory as a whole is different from the sum of its parts.
Behaviorism – School of thought that originally sought to bring greater credibility to psychology. Focused entirely on observable variables. I.e. Pavlov's dogs
Verbal Learning – Memorization referred to as "attachment of responses to stimuli" and forgetting was "loss of response availability"
Paired Associate – Dominant method of verbal learning. Memorizing paired words or non-sense syllables.
Modal Model – 4 Components – Sensory registers, short term store, long term store, and control processes.
Episodic-Semantic Distinction – find out
Tulving Triarchic Theory – Semantic memory is noetic because it requires conscious awareness.
Explicit-implicit distinction – When someone is actively trying to remember something vs. When a person is unaware that a memory is being used.
Fuzzy Trace Theories – 1st contains detailed in about a specific instance. 2nd is more general, categorical trace that captures general info.
Embodied Cognition – Idea that mental activity does not occur in a vacuum but is grounded in the type of world our bodies inhibit & the ways we use our bodies in this world. Thought is affected by how we interact with the world.
Experiment – Controlled situation where researcher manipulates variables of interest and measures effect.
Independent Variable – The variable being manipulated.
Dependent Variable – Variables being measured.
Correlation Study – Performance of a dependent measure is assessed as a function of some preexisting variable.
Case Study – Extensive analysis of an individual unit.
Intentional Learning – Also known as explicit learning, when people try to learn.
Incidental Learning – Someone just happens to learn something during a course of activities.
Levels of Processing – Degree to which people elaborate on information during a study.
Role Rehearsal – Repeating information over and over in order to memorize.
Elaborate Rehearsal – The more people think about the meaning of information, the more likely they are to use the knowledge they already have, making inferences & elaborate on the to-be-learned information.
Dual Code Theory – Suggests people store information in verbal/linguistic code and mental image code.
Generation Effect – Information a person generates is remembered better than something seen or heard.
Enactment Effect – Memory is better when people actually perform a task compared to watching someone else do it.
Automaticity of Encoding – Information is stored in memory with little effort.

Nominal Stimulus – What the experimenter thinks the participant is memorizing.
Functional Stimulus – The stimulus the participant identifies and thinks about.
Picture Superiority Effect – Pictures are remembered better than words.
Concreteness Effect – Words like "car" and "house" are remembered better than abstract info/words like truth, betrayal, or redemption.
Pollyanna Principle – Tendency to remember positive than negative words.
Frequency – Common things are easier to recall because there are more ways to get at them. Memory is better for frequent information for recall tests. But better for rare info on recognition tests.
Survival – People respond faster to words based on their subject level of danger or usefulness.
Recall – People repeat as much information from memory as they can.
Free Recall – Report as much information as you can.
Intrusions – Using free recall data to study errors of omission and of commission.
Forced Recall – Person is forced to repeat a certain amount of information. More information is recalled than free recall.
Cued Recall – People respond to either as many cues as they can, or to all of the cues, much like a forced recall test.
Retrieval Plan – Set of retrieval cues used to guide a person through information.
Jost's Law – Memories of a similar strength, older memories will decay more, slowly relative to newer memories
Reminiscence – Remembering forgotten info
Hypermnesia – Opposite of amnesia
Sensory Registers – The briefest memory systems.
Modality-Specific – Each brief memory information is retained specific to a sensory modality.
Haptic Sensory – Sensory register for touch.
Saccade – Otherwise known as eye movement.
Fixation – When our eyes land on some point in space.
Trans-saccadic Memory – Representation of objects, called object files.
Continuity Error – When the human brain doesn't realize errors like changing in clothing, objects randomly appearing, etc.
Haptic Sensory Memory – Takes into account qualities such as pressure and temperature. Lasts roughly 1.3 seconds.
Meta Memory – Aware of ones own memory.