

Chapter 1

Cognitive Psychology: An Introduction

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Memory and Cognition

- The mental events and knowledge we use to:
- Recognize an object
- Remember a name
- Have an idea
- Understand a sentence
- Solve a problem

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Cognitive Science

- The scientific study of:
 - Thought
 - Language
 - The brain
 - The mind

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Memory

The mental process of acquiring and retaining information for later retrieval (Verb)

The mental storage system that enables these processes (Noun)

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Cognition

The collection of mental processes and activities used in perceiving, remembering, thinking, and understanding, as well as the act of using those processes.

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Thinking about Thinking

- Introspection
- Metacognition
- For next 3 questions, pay attention (as much as possible) to your internal thought processes...

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Thinking About Thinking Three examples:

- How many hands did Aristotle have?
- What is 723 divided by 6?
- Does a robin have wings?

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Intuitive Cognitive Analysis

Answer
question

represent

sentence

words

letters

shapes

possible

calculate

retrieve

decide

compare

reason

situation

motivation

respond

speak

word

phoneme

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Review

- Memory
- Cognition
- Thinking about Thinking
 - introspection
 - insight
 - metacognition
- Intuitive Cognitive Analysis

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Thinking About Thinking Three More examples:

- How many hands does Bon Jovi have?
- What is 623 divided by 6?
- Does a square have four sides?

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Intuitive Cognitive Analysis

- Your own perception of what it seems like your brain is doing combined with a logical analysis of what must be taking place.
- “Introspection” = first-person experience
- Task analysis = steps that must be occurring for task to be completed

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Intuitive Cognitive Analysis - Issues

- Some processes not available to conscious awareness - the Subconscious
- Reliability of first-person statements?
- Person-to-person variability?
- Only one way to complete a task?

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Summary of Cognitive Analysis

(Overview of topics in this course by chapter)

Table 1-1 SUMMARY OF THE INTUITIVE COGNITIVE ANALYSIS

Processes	Topic and Chapter
Sensory and perceptual Focus eyes on print Encode and recognize printed material	Visual perception, sensory memory: Chapter 3 Pattern recognition, reading: Chapters 3 and 10
Memory and retrieval Look up and identify words in memory Retrieve word meanings	Memory retrieval: Chapters 5–8
Comprehension Combine word meanings to yield sentence meaning Evaluate sentence meaning, consider alternative meanings	Semantic retrieval, comprehension: Chapter 7–10 Comprehension: Chapters 9 and 10
Judgment and decision Retrieve answer to the question Determine reasonableness of question Judge speaker's intent and knowledge	Semantic retrieval: Chapters 8 and 9 Comprehension, conversation: Chapters 9 and 10 Decision making and reasoning: Chapter 11
Computational (Question 2) Retrieve fact knowledge Retrieve knowledge of how to divide and execute procedure	Semantic retrieval: Chapter 7 Procedural knowledge: Chapters 6, 11, and 12

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Philosophical Considerations

- Mind = the entity that can process information and display intelligence
- Brain = the organ in your noggin
- Mind --> Brain?
- Brain --> Mind?
- Metaphysics : monism vs. dualism? Soul? Afterlife?
- Assumption : Mind = Brain = Mind

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Schools of Thought

- Philosophy
 - Aristotle and Tabula Rasa
 - Plato
- Psychology
 - Wilhelm Wundt and Introspection
 - Edward Titchener and Structuralism
 - Herman Ebbinghaus, the father of human memory research.
 - William James and Functionalism

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Plato : Phaedrus 370 BCE

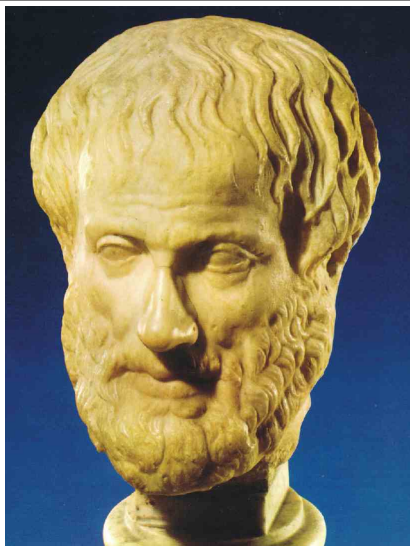


Soc: Thamus replied: [...] for this discovery of yours will create forgetfulness in the learners' souls, because they will not use their memories; they will trust to the external written characters and not remember of themselves. The specific which you have discovered is an aid not to memory, but to reminiscence, and you give your disciples not truth, but only the semblance of truth; **they will be hearers of many things and will have learned nothing**; they will appear to be omniscient and will generally know nothing; they will be tiresome company, having the show of wisdom without the reality.

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Aristotle: De Memoria 350 BCE

Memory is, therefore, neither Perception nor Conception, but a state or affection of one of these, conditioned by lapse of time. As already observed, there is no such thing as memory of the present while present, for the present is object only of perception, and the future, of expectation, but the object of memory is the past. **All memory, therefore, implies a time elapsed; consequently only those animals which perceive time remember, and the organ whereby they perceive time is also that whereby they remember.**



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Descartes : Principles of Philosophy (17th century)



VII. That we cannot doubt of our existence while we doubt, and that this is the first knowledge we acquire when we philosophize in order. While we thus reject all of which we can entertain the smallest doubt, and even imagine that it is false, we easily indeed suppose that there is neither God, nor sky, nor bodies, and that we ourselves even have neither hands nor feet, nor, finally, a body; but we cannot in the same way suppose that we are not while we doubt of the truth of these things; for there is a repugnance in conceiving that what thinks does not exist at the very time when it thinks. Accordingly, the knowledge, I think, therefore I am, is the first and most certain that occurs to one who philosophizes orderly.

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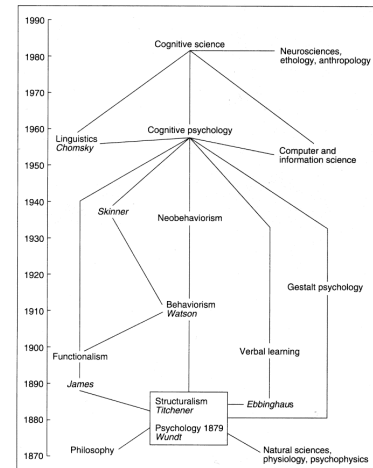
Philosophy vs. Science?

- Philosophers were *generating hypotheses*
- Informal testing (“thought experiments”)
- Not systematic
- Not collecting data
- Not experimental
- Not practicing the *scientific method*

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History of Cognitive Psychology



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History of Cognitive Psychology

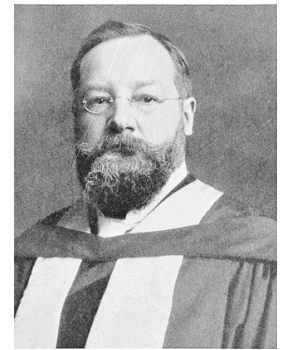
- Wilhelm Wundt
 - German physiologist
 - Established as own science
 - Introspection
 - Topics:
 - “conscious processes and immediate experience”



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History of Cognitive Psychology

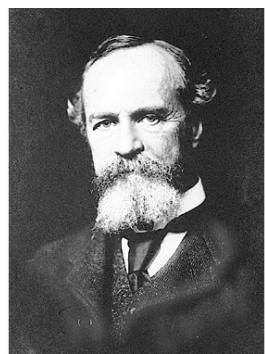
- Edward Titchener
 - 1st School of Thought
 - Structuralism
 - Topic:
 - what are the “basic elements” of the mind?
 - Methods:
 - rigorously trained introspection



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History of Cognitive Psychology

- William James
 - 2nd School of Thought
 - Functionalism
 - Topic: how does the mind work? What is it useful for?
 - Methods: Informal, philosophical
 - Proposed that human memory is composed of two systems (analogous to STM and LTM)



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History of Cognitive Psychology

- Hermann von Ebbinghaus
 - “Father of Memory Research”
 - Savings Score
 - Topic: verbal learning / memory
 - Methods: scientific methods (with himself as subject)

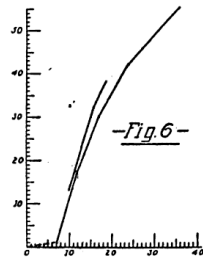


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Ebbinghaus 1885

At first the ascent of the curve is very steep, but later on it appears to gradually flatten out. For the mastery of five times

- First modern scientific research into human memory

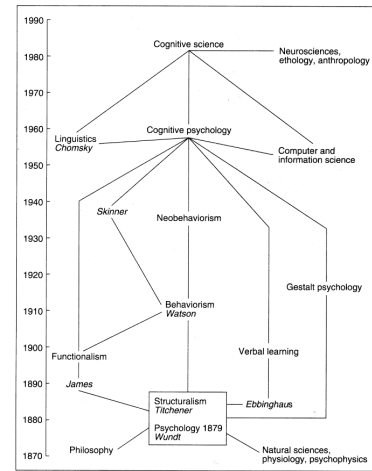


- APA format?

the number of syllables that can be reproduced after but one reading—i.e., after about 3 seconds—over 50 repetitions were necessary, requiring an uninterrupted and concentrated effort for fifteen minutes.

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History of Cognitive Psychology



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Behaviorism

- John Watson
 - Founder of Behaviorism
 - Observable Behaviors
 - No Mental Processes



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Strict Behaviorism

- John Watson, the founder of behaviorism
- A response to Wundt's introspection
- The scientific study of observable behavior only
- Since mental processes can't be seen, they have no place in psychology
- Behaviorism is "antimentalistic"
- Modern Evaluation?
 - methodological rigor was needed
 - antimentalism was an overreaction



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Behaviorism

- John Watson
- "Give me a dozen healthy infants, well-formed, and my only specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select - doctor, lawyer, artist, merchant, chief, and yes even beggarman and thief, regardless of the talents, penchants, tendencies, abilities, vocations and race of his ancestors"

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Challenges to Behaviorism

- "The Misbehavior of Organisms"
- World War II
- Verbal learning
- Linguistics-- Chomsky versus Skinner
- The mind/computer analogy-- humans are information processors too
- Telecommunication analogies...

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“Misbehavior” of organisms

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Verbal Learning

- Evidence of meaning in “nonsense” syllables
- Semantic Clustering of recall

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Linguistics

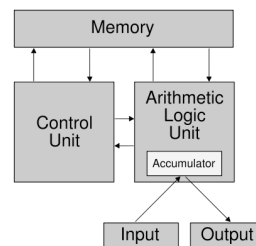
- Linguistics-- Chomsky versus Skinner
- “Skinnerism is the final philosophic statement of the puritanical protestant-ethic manipulators who dominated the world for 400 years up to Hiroshima” (Leary, 1977)
- “Defining psychology as the science of behavior was like defining physics as the science of meter reading” (Chomsky, as quoted by George Miller)

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Computers - Von Neumann Architecture

- The mind/computer analogy-- humans are information processors too



- Modular, sequential design with serial stages of processing
- Perhaps the brain is structured similarly and works the same way?
- Or do we have it backwards?

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Channel Capacity

- Limited Capacity
- Bandwidth

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Assumptions of Cognitive Psychology

- Mental processes exist!
- Mental processes can be studied scientifically (by using speed or accuracy as DV's).
- Human beings are active information processors.
- Humans are not necessarily special : it should be possible to deconstruct and reconstruct mental processes in other substrates (e.g. a computer)

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Methods

- Time
- Accuracy

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Reaction Time

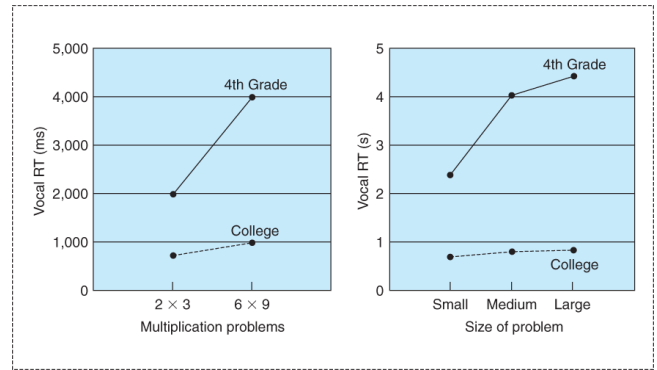


Figure 1-2
Vocal response times (RTs) to multiplication problems.

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CogLab: Partial Report

- “Perceptual Span” : how many items could be seen with a “brief exposure”
- Research suggested about 4.5
- George Sperling (1960)
 - “more than is seen than can be remembered”
- Problem: report is too slow
- Solution: partial report
- 7 Experiments

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CogLab: Partial Report

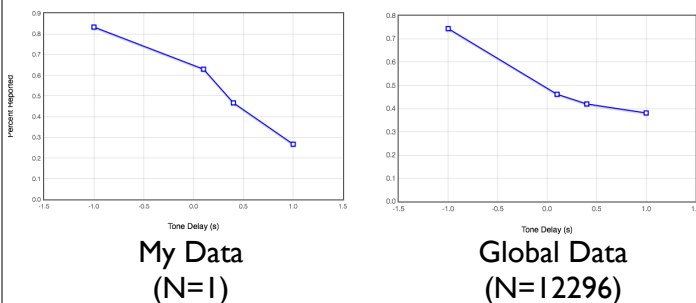
- Tachistoscope



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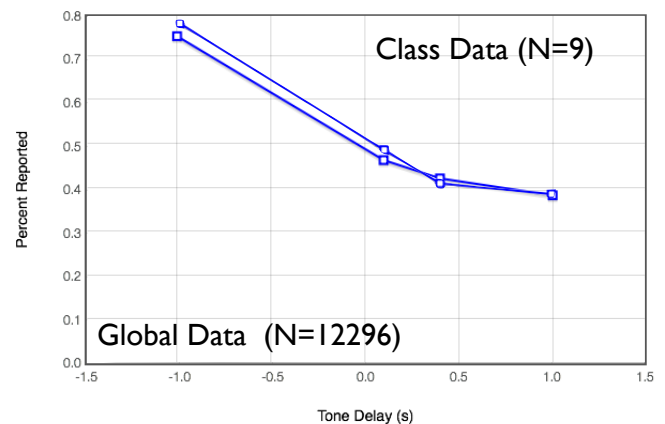
CogLab: Partial Report



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CogLab: Partial Report



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CogLab: Partial Report

- Debriefing
- Methods?
- Predictions?
- Robust? Limitations?

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Ecological Validity

- Neisser's term for the degree to which our lab tasks resemble "real world" cognition.
- Also called External Validity.

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The Reductionist Approach

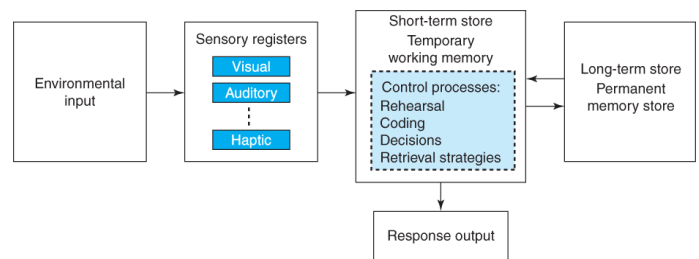
An attempt to understand complex events by breaking them down into their components.

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Information Processing and Cognitive Science

- Atkinson Shiffrin "Standard Model" aka "Standard Theory"

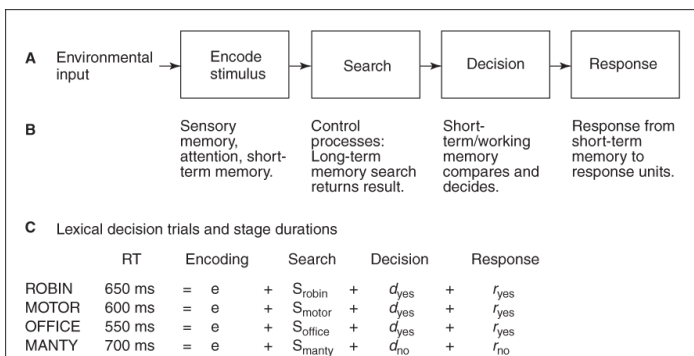


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Process Model (Sternberg)

- Lexical Decision Task



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Process Model

- Assumptions
 - Sequential Stages
 - Independent and Non-overlapping
- Challenges
 - Example: Typing (4 stages) - parallel processing
 - Context Effects (Priming)
 - faster to ID "MOTOR" 2nd time

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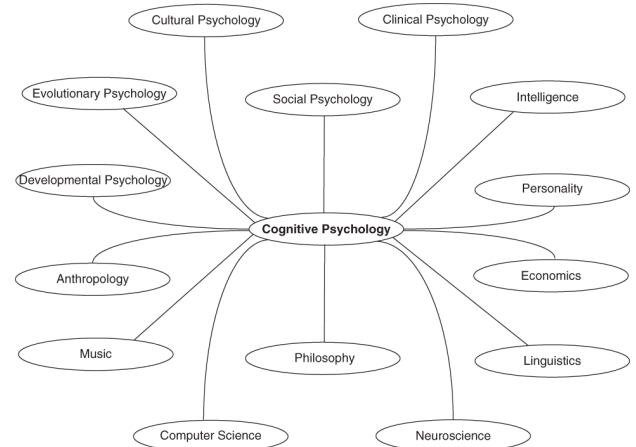
Ideas

- Parallel Processing
- Non-independence
- Bidirectional influence
- Hierarchy

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Cognitive Psychology



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Summary of Major Topics Covered in Chapter 1

- Thinking about thinking
- Memory and cognition defined
- History of Cognitive Psychology
- Cognitive psychology and information processing.

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Seven Themes of Cognition

- Attention
- Data-Driven vs. Conceptually Driven
- Representation
- Implicit vs. Explicit
- Metacognition
- Brain
- Embodiment

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