Chapter 1: Introduction to Cognitive Psychology

*Chapter Outline*

1. COGNITIVE PSYCHOLOGY: STUDYING THE MIND
   1. What Is the Mind?
   2. Studying the Mind: Early Work in Cognitive Psychology
      1. Donders’s Pioneering Experiment: How Long Does It Take to Make a Decision?
      2. Wundt’s Psychology Laboratory: Structuralism and Analytic Introspection
      3. Ebbinghaus’s Memory Experiment: What Is the Time Course of Forgetting?
      4. William James’s *Principles of Psychology*
2. ABANDONING THE STUDY OF THE MIND
   1. Watson Founds Behaviorism
   2. Skinner’s Operant Conditioning
   3. Setting the Stage for the Reemergence of the Mind in Psychology
3. THE REBIRTH OF THE STUDY OF THE MIND
   1. Paradigms and Paradigm Shifts
   2. Introduction of the Digital Computer
      1. Flow Diagrams for Computers
      2. Flow Diagrams for the Mind
   3. Conferences on Artificial Intelligence and Information Theory
   4. The Cognitive "Revolution" Took a While
4. THE EVOLUTION OF COGNITIVE PSYCHOLOGY
   1. What Neisser Wrote
   2. Studying Higher Mental Processes
   3. Studying the Physiology of Cognition
      1. New Perspectives on Behavior
5. SOMETHING TO CONSIDER: LEARNING FROM THIS BOOK

TEST YOURSELF 1.1

CogLabs: Simple Detection

#### Web Links

**Cognitive Psychology**

An overview of the history and domains of cognitive psychology.

[**http://www.scholarpedia.org/article/Cognitive\_psychology**](%09http:/www.scholarpedia.org/article/Cognitive_psychology)

**Today in the History of Psychology**

Searchable historical database organized by date or keywords.

[http://www.cwu.edu/~warre](http://www.cwu.edu/~warren/today.html)[n/today.html](http://www.cwu.edu/~warren/today.html)

**History of Psychology Calendar**

Students can click on any day of the year to learn about historical facts related to psychology.

<http://www.cwu.edu/~warren/calendar/datepick.html>

# Encyclopedia of Psychology

Interactive encyclopedia of topics related to the history of psychology.

<http://www.psychology.org/links/People_and_History/>

**Classics in the History of Psychology**

Resource for students interested in the history of psychology.

[http://psychclassics.y](http://psychclassics.yorku.ca/)[orku.ca/](http://psychclassics.yorku.ca/)

**The History of Psychology by Dr. C. George Boeree**

E-text about the historical and philosophical background of psychology.

<http://www.ship.edu/~cgboeree/historyofpsych.html>

**Cognitive Science Dictionary**

A site available for those who may be unfamiliar with the many unique terms found in the related fields of cognitive psychology, cognitive science, and cognitive neuroscience.

<http://www.bcp.psych.ualberta.ca/~mike/Pearl_Street/Dictionary/dictionary.html>

**Cognitive Science Celebrities**

Writings by and about leading thinkers in cognitive science, and critics and observers of the philosophy of mind.

<http://penta3.ufrgs.br/educacao/teoricos/MIND/para_saber_mais/Cognitive_Science_Celebrities.htm>

A roster and pictures of some of the most famous Cognitive Psychology contributors.

<http://www.bcp.psych.ualberta.ca/~mike/Pearl_Street/Gallery/index.html>

**Videos**

**History of Cognitive Psychology (via Google Search Story) (Time: 0:35)**

A quick snapshot video (35 seconds) over the history of cognitive psychology from the Greeks (Plato) to the recent past (Donders, Skinner, and the first computers) to the present (Pinker and brain scanning technology) to the future (wherever that may be). The video could be used as a very quick introduction to chapter 1.

<https://www.youtube.com/watch?v=9PYrem2LpL0>

**Structuralism vs. Functionalism (Time: 22:52)**

Video compares and contrasts structuralism and functionalism on seven fronts.

<https://www.youtube.com/watch?v=RFVN0Dv45Ik>

**Early Reaction Time Research in Psychology (Time: 5:48)**

Exploring the history of reaction time experiments and different methods and instruments used to measure time.

<https://www.youtube.com/watch?v=8UhQoYBPfpQ>

**Noam Chomsky v. B. F. Skinner (Time: 58:04)**

A compilation of short video segments of Chomsky and Skinner and their thoughts on psychology.

<https://www.youtube.com/watch?v=FlyU_M20hMk>

**Reaction Time Experiment (Time: 2:24)**

This video shows a possible method to compute reaction times using playing cards (stimuli) and phones (reaction time measuring devices).

<https://www.youtube.com/watch?v=9ufrEAJDsNs&feature=youtu.be>

**Apps and/or Software**

**Reaction Test Pro (Free)**

A simple reaction time app with timing to the millionths of a second.

<https://itunes.apple.com/us/app/reaction-test-pro/id493360516?mt=8%20reaction%20time>

**Dual Music ($0.99)**

Though a little different than the experiment of Cherry (1953) cited in the text, the following app allows for simultaneous playing of non-DRM (Digital Rights Management) protected files which can give the listener some insights into the difficulty of processing simultaneous signals from different sources.

<https://itunes.apple.com/us/app/dual-music-listening-background/id658408034?mt=8>

**PsychGuide (Free)**

An app designed for psychology students to easily access information about their discipline from history, to jobs, to classic studies. <https://itunes.apple.com/us/app/psychguide/id440790994?mt=8>

*Discussion Questions*

* + - 1. To introduce the nature of the course, ask students to answer a simple question that the instructor writes on the board. (Many general knowledge questions will work well. An example might be, “What is the capital of Vermont?”)

Ask students to indicate what cognitive/mental processes are necessary to answer the question. They will likely overlook many processes. The instructor can outline a variety of the processes, both explicit and implicit, including perception of “lines” into familiar patterns/letters, memory and language comprehension processes, and judgment making (including ideas relevant to the context but beyond the answer we seek, such as “Why is the instructor asking us this silly question in a cognition course?”). Point out to students some of the ways in which our knowledge guides us effortlessly toward the answers we seek, even when the information we’re working with could be considered ambiguous (e.g., a possible answer to the sample question above is “the letter V!”).

The instructor can highlight how unconscious and complex so much of cognition is and ask students to discuss the challenges these aspects of cognition pose for cognitive researchers. How can cognition be studied “indirectly”?

1. To reinforce the impact of the invention of the computer on the start of the “Cognitive Revolution,” have students generate/diagram ideas about a human/computer analogy in terms of information processing. Ask students to generate ideas about how humans and computers are both similar and different in how they process information. How does the analogy suggest ways for cognitive psychologists to study the mind? What are the limitations of this analogy and, thus, the challenges that will be faced when studying cognition of the mind?
2. Discuss the concept that mental responses cannot be measured directly but rather must be inferred from behavioral measures. Briefly discuss Donders’s decision-making experiment. Ask students to generate basic ideas about how humans read letters or familiar words. Ask students to extrapolate from Donders’s methodology to design a simple experiment to study the time course of reading.
3. Have students develop a model of memory based on the concepts of Arkinson and Shiffrin and Tulving, describing the process of how information is received and processed. Ask them to generate examples for each component of long-term memory.

### Demonstrations

* + - 1. Ask students to identify one cognitive activity they engage in during the day (e.g., studying for a test; using various apps on their phone; navigating using a GPS system; and driving a car) and then have them identify the different processes (e.g., pattern identification, short-term/working memory, and attention) that must occur for them to successfully engage in that process. Suggest for them to use the different chapters to identify possible processes they may use.
      2. Develop an analytical introspection experiment to be conducted by the students. Give students a paired-associate learning task. Instruct students that they will learn words in pairs (e.g., tree-boat). During the recall portion of the experiment, they will be presented with one of the words from each pair, and they will be asked to report the other word of each pair. Then, have students perform their own individual “analytical introspection experiment” in which they each describe their experiences and thought processes about how they tried to remember the word pairs. Discuss the students’ results from this introspection procedure. Highlight major points of introspection obtained, such as how self-report experiments generate variable results from one person to another.
      3. Describe a simple semantic priming experiment to demonstrate mental chronometry. Describe mental chronometry and reaction time measures. Explain how showing one word can facilitate the processing of another associated word. Explain the concepts of prime stimulus (e.g., “dog”) and the target stimulus (e.g., “cat”). Explain how the participant in a priming experiment makes some response to the target stimulus (you might introduce either naming or lexical decision here). Explain that, to measure the time course of the priming effect, we use a comparative (subtraction) technique. You could present (or ask students to predict) sample reaction times across “related” (e.g., dog-cat) and “unrelated” (e.g., fog-cat) trials and show that people typically respond faster on related trials, relative to unrelated trials. Finally, you can ask students to generate cognitive explanations for why the priming effect occurs.
      4. Using the **Reaction Time Experiment** as the foundation for the activity, create some stimuli using a presentation software (e.g., Power Point) and have students use the “stopwatch” function on their phones to measure their reaction times to the stimuli you present. Alternatively, students could download the **Reaction Time Pro App** and you could have a contest as to who has the quickest reaction time.
      5. Students are often surprised at how much information about human cognition is determined by using very “simple” tasks. Demonstrate a simple memory experiment such as a delayed recognition task. At the beginning of class, present to the class a series of 20 common nouns (e.g., pot and bike). Tell the class that you will explain the “experiment” further at a later point in the lecture. Sometime later during the class, distribute a recognition test of 40 words (20 that had been presented earlier and 20 that had not). Instruct students to circle only the words they remember as having been presented earlier. Then, present students with an answer key showing the 20 words that should have been circled and ask them to score their tests. You can calculate a mean accuracy for the class. Discuss how accuracy, in addition to reaction time, is used as a measure of cognition.

(Note: You have a great deal of flexibility in what specific properties of memory to incorporate into your demo. For instance, you might create a recognition test where some of the distracters are synonyms of words that were actually presented (e.g., pan included in recognition test, instead of pot) to show how recognition errors are more likely to occur with “associated” items.)

CogLab Instructor’s Material:

Simple Detection

Introduction

One of the most basic processes in cognitive psychology is the ability of a subject to detect a stimulus and execute a response. In the simplest detection paradigm, like the one in the Simple Detection CogLab, participants are presented a simple stimulus and must respond when the stimulus is detected. Reaction time for detecting the stimulus and responding is generally the dependent variable with responses ranging between 200 and 300 milliseconds (ms).

Part I

Student Projects and Critical Thinking Exercises

1. As a critical thinking project, have students design their own simple detection experiment where the type of the stimulus (e.g., other modalities like taste, hearing, touch, and smell) and response (e.g., different types of manual responses and vocal response).
   1. Students could perform mini-experiments using other members of the class as participants. Students could record the speed of responding for different pairings of stimulus and response and discuss why different pairings produced differential results.
   2. Results could be calculated and compared for fun or as an intro to an APA-formatted paper. Students could use one to two articles as references for their paper.
2. For a critical research topic, have students look through the literature on how simple detection may influence game playing. Students could explore how practice might influence the speed of responding not only in a simple detection task, but also in more complex tasks (e.g., complex decisions in video games).
   1. Have students write a short APA-formatted paper on this topic or another example (e.g., driving a car and braking or other complex decisions in driving).
3. Have students write a paper or at least think about and discuss how manipulating stimulus characteristics (e.g., size, shape, location, or intensity of the stimulus) may affect detection.
   1. Have students think about how other variables outside of the stimulus might affect performance. For example, what if the subject needed to complete 100 trials versus 1000 trials? Or, how would the natural arousal levels affect performance?

Part II

Possible Test Questions

Basic or Introductory Questions

1. What is simple about simple detection?

Answer: In a simple detection paradigm the simple denotes that there is only a single stimulus that must be detected and responded to. The subject does not need to decide which of multiple stimuli were presented.

1. If a subject responds slowly in a standard simple detection task like that found in CogLab, is it possible to distinguish whether the slowed response is related to detection of the stimulus or related to the response.

Answer: In a standard simple detection task like that found in CogLab, it is NOT possible to distinguish whether the slowed response is related to detection of the stimulus or related to the response. One would need to have additional conditions or stimuli to start to be able to distinguish between slowed responses due to detection versus responding.

Research/Cognition-Based Questions

1. The dependent measure in the simple detection experiment was reaction time to respond. What other dependent variable could be measured?

Answer: Another possible measure could be the number of trials on which the subject responded prior to presentation of the stimulus.

1. What might happen to reaction times on trials following a trial that the subject had responded prior to the stimulus being presented?

Answer: If the subject is truly engaged in the task, it may be that they become more conservative on the following trial and therefore their reaction time might slow down.

Advanced Questions

1. In major league baseball, the pitcher may throw the ball at 95 mph. This means that it takes about 400 milliseconds for the ball to leave the pitcher’s hand and arrive at the plate. Given what you know about response times from this lab, speculate on how a major league hitter might be able to hit the ball.

**Answer:** The lab indicates that often it takes around 250 milliseconds to make a simple detection response. To swing a bat at a particular place must take at least this long, so the hitter must start the swing when the ball is no further than half way to the plate. An effective hitter must be able to read the pitcher’s wind up and release and know where the ball is going to be before they see it.

Discussion Questions

1. If one were to compare simple detection performance in college-age and elderly subjects, one would likely find that responses for elderly subjects are slower than the college-age subjects in the detection task. Discuss some of the possible reasons why such a pattern of results would obtain.

Answer: It is likely that the elderly subjects are slower at both detection of the stimulus (i.e., decreased visual processing) and executing the motor response. One possible method would be to create comparable conditions by creating age-equivalent (and visual system equivalent) visual stimuli (e.g., degrading the stimulus for college-age students to make it similar to what an elderly person may see). By using age-equivalent stimuli, one could then see whether there are any response differences.

Part III

Group or Online Projects

1. Have your students consider specific situations or occupations where having a quick simple detection time would be an (dis)advantage (e.g., drag racer, waiting too long after the traffic light turns green, video games, and detecting warning light on automobile dashboard).
   1. This can be done in groups in the classroom or as an online discussion assignment.

## Part IV

**Multiple**-**Choice Questions**

1. Imagine a simple detection study where on 90% of the trials the stimulus is presented at the fixation point, but on 10% of the trials the stimulus would appear in one of the four corners of the screen. What result would you expect on those 10% of the trials relative to the other 90% of trials?
   1. Reaction times would likely be **faster** on the 10% trials than the 90% trials.
   2. Reaction times would likely be **slower** on the 10% trials than the 90% trials.
   3. Reaction times would likely be **the same** on the 10% trials as on the 90% trials.
   4. Reaction time would likely be **the same** on the **first** 10% trial as on the 90% trials.

(b)

1. Student A has an average reaction time of 450 ms in the simple detection study. Which conclusion is most likely?
   1. The student’s reaction times appear to be much faster than one would expect in such a simple detection task.
   2. The student’s reaction times appear to be much slower than one would expect in such a simple detection task.
   3. The student’s reaction times appear to be about the average of what one would expect in such a simple detection task.
   4. All of the above

(b)

1. In a simple detection study, a participant must
   1. detect and respond to a single stimulus.
   2. detect which of several stimuli were presented on a single trial.
   3. make either a simple or complex response.
   4. detect a single stimulus, but make a complex response.

(a)