Chapter One — The Science of Mind: The Discipline of Psychology

I. INTRODUCTION

WHAT IS PSYCHOLOGY?

Chapter One Learning Objectives

After reading this chapter, you should be able to:

1. Explain the subject matter that psychologists study, addressing the meaning of mind and psychology’s role as a hub science.

2. Analyze the respective contributions of philosophy and the physical sciences as the “roots” of modern psychology.

3. Compare and contrast the early movements in psychology—structuralism, Gestalt psychology, functionalism, behaviorism, psychodynamic theory, and humanism—in terms of leading figures, core principles, and contribution to modern psychology.

4. Differentiate the seven major perspectives of modern mainstream psychology in terms of typical research questions, research methods, and focal causes of behavior.

5. Analyze the ways in which the seven major perspectives can be integrated to address a single psychological problem or topic.

6. Explain why psychology’s role as a “hub science” allows psychologists to pursue a wide range of career paths with respect to professional specialties and research areas.
Objective

- LO1: Explain the subject matter that psychologists study, addressing the meaning of mind and psychology’s role as a hub science.

- Watch One or both of the following online videos:

1. What is unique about your mental world?
2. What did you find most compelling about Ramachandran’s lecture?
3. What do these disorders of the brain teach us about the mind?
4. What are your thoughts on creativity in light of this lecture?
5. We will use this to link to later class lectures too!
Objective

- LO1: Explain the subject matter that psychologists study, addressing the meaning of mind and psychology’s role as a hub science.

Psychological science provides us with explanations for behavior that we otherwise might not know from direct observation alone. Psychology consists of multiple perspectives (e.g., developmental, social, and biological) that, when integrated, give us a broader context for understanding human behavior.

1. What Is Psychology?

- Psychological scientists view the mind as a way of talking about the brain and its activities, including thought, emotion, and behavior.
- The word psychology is a combination of two Greek words: psyche (or psuche), or the soul (“soul” in Ancient Greece was closer to our modern conception of mind), and logos, the study of, literally translated to the study of the mind.
- Today, psychology is defined as the scientific study of behavior and mental processes.
- “Behavior” refers to any action that we can observe.
- Studying “mental processes” has been highly dependent on the methods available to psychologists.
- Early efforts to study mental processes relied on the use of introspection, or the personal observation of your own thoughts, feelings, and behaviors. Because it’s difficult for others to confirm one’s introspections, they are hard to validate using the scientific method.
- Brain imaging methods have dramatically improved our ability to reliably study mental processes.

2. Psychology as a Hub Science

- Most occupations require some degree of understanding of people and their behavior. Psychology is integral to a wide variety of professions.
- When Kevin Boyack and his colleagues used journal articles to create a map of how different concentrations link to each other, they realized that psychology is one of the major hub sciences—many of the articles showed strong connections between psychology and other disciplines, such as medical sciences, education, social sciences, etc.
Reflections

- What have you learned so far about the link between psychology and the world around us?
- What did you find particularly surprising or interesting?

Objective

- LO1: Explain the subject matter that psychologists study, addressing the meaning of mind and psychology’s role as a hub science.
- LO2: Analyze the respective contributions of philosophy and the physical sciences as the “roots” of modern psychology.

II. WHAT ARE PSYCHOLOGY’S ROOTS?

The Philosophers’ Questions/The Physical Scientists’ Methods

Objective

- LO2: Analyze the respective contributions of philosophy and the physical sciences as the “roots” of modern psychology.

1. The Philosophers’ Questions
   - Plato (427-347 B.C.) was one of the first philosophers to address the question, “What is the mind?”
   - Plato described the mind as having three parts that must be in balance: spirit, reason, and appetite. He used the analogy of a team of horses to explain how these three parts work in concert. The horses (spirit and appetite) are guided by a driver (reason). This is akin to Freud’s tripartite model of the mind: the id (inborn aggressive and sexual impulses), the ego (self), and the superego (conscience).
   - Philosophers were split between dualism, the idea that the body and mind are different and separate (Pythagoras, Socrates, and Plato), and monism, the idea that the body and mind are not separate (Democritus and Aristotle).

   - With the fall of Ancient Greece and Rome, monism lost favor and dualism was the predominant belief. Christian thinkers wrote about a duality between body and soul. Dualism continued to have prominence throughout the Renaissance.
   - Rene Descartes (1596-1650) was a proponent of mind-body dualism, the belief that the body is mechanical but that the mind is a non-physical entity not suitable for scientific inquiry. He also believed that ideas and emotions were innate.
   - Empiricists (17th century British school of philosophy) saw the mind as a “blank slate” or tabula rasa at birth that is filled as an individual experiences the world.
• Empiricism gave rise to behaviorism (20th century), which holds that behaviors are the result of experience and can be directly observed.
• The philosophical debate about the source of knowledge is akin to the psychologist’s pursuit to determine the relative contributions of nurture and nature to behavior.
• Contemporary scientists believe in monism, but accept that there is a reciprocal relationship between biology and behavior, and that the mind is the result of complex interactions between inborn characteristics and experiences.
• Philosophy and psychology are closely intertwined, with the former giving rise to the latter. Nineteenth century philosophers such as Alexander Bain (1818-1903) argued for the experimental study of human behavior and as this testing occurred, psychology took shape as a separate discipline.

2. The Physical Scientists’ Methods
   • Ancient Physicians
     ▪ As many as 7,000 years ago, healers used trepanation (drilling holes into the skull) to address some conditions, indicative that they believed the head and brain had some relationship to the mind.
     ▪ Early Egyptians understood that the paralysis of the body was permanent and due to brain damage.
     ▪ As early as 500 B.C., Greek physicians began to systematically dissect human bodies, concluding the brain was the organ of memory, thinking, and understanding. That saw the connection of the brain to the sense organs. They recognized the brain as the source of emotional problems.
     ▪ Greek physicians held a theory of personality that is affected by “humors,” or relative amounts of four fluids in the body: yellow bile, black bile, blood, and phlegm. Bleeding patients was a practical application of this theory. The theory remained popular until the 19th century.
     ▪ Development of technology: 17th and 18th centuries scientists used new technologies to make discoveries about the human body and mind. For example, they used the light telescope to discover that a single sensory nerve carries only one type of information.
     ▪ Hermann von Helmholtz (1821-1894) discovered that it took longer for participants to react when their toe was touched than when their thigh was touched (because it is farther from the brain and the signal takes longer to travel). This research contributed to a more scientific, less mystical view of the nervous system.

III. HOW DID THE SCIENCE OF PSYCHOLOGY BEGIN?
Exercise: The Introspection Illusion

The introspection illusion is the tendency for people to treat their own introspections as reliable when making judgments about themselves, but judge other people on the basis of their behavior. Listen to this podcast:


Consider the following:

Think of a time when you felt you were misinterpreted on the basis of your actions, instead of your true beliefs or feelings (e.g., arriving late because you didn’t care about the other party). Now try to think of a time when you might have been guilty of the introspection illusion. What happened? What might you have done differently?

- LO3: Compare and contrast the early movements in psychology – structuralism, Gestalt psychology, functionalism, behaviorism, psychodynamic theory, and humanism – in terms of leading figures, core principles, and contribution to modern psychology.

1. Wilhelm Wundt (1832-1920) and Structuralism
   - Credited with being the first psychologist
   - Conducted the first psychological experiment in his laboratory at the University of Leipzig in 1879: a test of reaction time (How quickly after hearing a ball drop onto a platform could a person respond by striking a telegraph key?)
   - Believed the goal of psychology was to understand consciousness
   - Viewed mental experience as a hierarchy: the mind constructs an overall perception out of building blocks made up of separate sensations and emotional responses

2. Edward Titchener (1867-1923)
   - One of Wundt’s students who expanded on Wundt’s work to establish a theory of structuralism
     - Structuralism: the mind can be broken down into the smallest elements of mental experience (a parallel to the physical sciences that was focused on breaking down matter into molecules, elements, and atoms)
   - Employed introspection as an experimental technique
     - Wundt’s introspection is focused on an action being representative of an internal state. Titchener would instruct research participants to describe an object in great detail, the details serving as the building blocks of the mind’s overall perception of the cup.

3. Gestalt Psychology
A group of early 20th century German psychologists, including Kurt Koffka, Max Wertheimer, and Wolfgang Köhler rejected the structuralists’ approach and founded Gestalt psychology.

- Gestalt means “form” or a “whole”
- Gestalt psychologists believed that breaking down a whole perception into its component parts would result in a loss of important psychological information. They emphasized the importance of context in perception. (The whole is greater than the sum of the parts.)

Max Wertheimer conducted an experiment in 1912 that demonstrated the apparent movement of objects, launching the Gestalt psychology movement. He used a stroboscope to create the perception of movement, using the appearance and disappearance of lines. He concluded that there must be more to perception than just sending elements in order to perceive stationary lines as moving. (This discovery has been practically applied to moving words in scrolling electric signs, an illusion created by simply timing lights to blink on and off.)

Today, Gestalt principles of perception are applied to design to draw our eyes in certain ways, induce us to perceive hidden messages, and create striking memorable images.

**Reflections**

- What relationship does this have with psychology?
- Think of an example.
  
  In the first lecture, Dr. Charlotte talked about not “seeing” the partially hidden camels (a tourist attraction) during a vacation on the beach in Mexico.

**Early Movements (continued)**

**William James (1842-1910) and Functionalism**

- Functionalism viewed behavior as purposeful because it leads to survival. It was influenced by the publication of Charles Darwin’s Origin of the Species in 1859.
- Functionalists were interested in why behavior and mental processes worked in a particular way.
- William James was the principle proponent of Functionalism. He wrote *Principles of Psychology*, a textbook that dominated the field for 50 years. James offered a course in psychology at Harvard and had a lab that predated Wundt’s, but his lab was used primarily for demonstration, rather than research, so Wundt is still credited as the first psychologist.
- James coined the term *stream of consciousness* to describe the flow of ideas people experience when they are awake. He also wrote “The Varieties of Religious Experience”
• James emphasized the role of evolution in mental processes and behavior. The value of an activity depended on its consequences. Behavior that increased survival is repeated and those that are irrelevant or harmful are abandoned.

• Although James didn’t establish a particular school of psychology, his ideas continue to be integral to the work of many contemporary psychologists.

**Video Connection**

The following is a simple but effective online clip that demonstrates the differences between Wundt and James: “Wundt and James: Structuralism and Functionalism.” (March 2011). Psychology 101: The Animated TextVook. Available at: [http://www.youtube.com/watch?v=SW6nm69Z_1E](http://www.youtube.com/watch?v=SW6nm69Z_1E) (1:11). [Accessed 25 May 2012].

**Early Movements (continued)**

The Behaviorists and the Cognitive Revolution

• **Behaviorism**, which focuses on observable, measurable behaviors, gained favor in the first half of the 20th century. Many behaviorists studied animals, and relying on Darwin’s evidence linking animals to humans, extrapolated what they learned about animals to humans.

• **Ivan Petrovitch Pavlov’s** (1849-1936) discovery that dogs salivate in response to the arrival of a dog Nadler or being harnessed for an experiment (indicating that they associated these signals with the arrival of food) gave rise to the Classical Conditioning theory of learning.

• **John B. Watson** (1878-1958) came to the same conclusions as Pavlov while studying rats. He was a proponent of the British empiricists “blank slate” understanding of the mind, believing that he could take any infant and raise them to become any type of specialist regardless of the baby’s talents, abilities, or history. Watson applied his theory to advertising, discovering that a product could be made successful by building an association between the product and an appealing image.

• **Edward Thorndike** (1874-1949) proposed a law of effect, which suggested that behaviors followed by pleasant or helpful outcomes would be more likely to occur in the future, whereas behaviors followed by unpleasant or harmful outcomes would be less likely to occur. He based this on observations of cats’ behavior in a puzzle box—through trial and error learning, the cats would escape faster and faster on successive trial, repeating effective behaviors and abandoning ineffective ones.

• **B.F. Skinner** (1904-1990) was interested in the effects of consequences on how frequently behaviors were performed. He studied rats and pigeons in Skinner
boxes, generalizing what he learned to human behavior, leading to a host of beneficial applications in smoking cessation and treatment for children with autism.

- **Ulric Neisser** (1928– ) first challenged the notion that internal mental states (e.g., information, processing, thinking, reasoning, and problem solving) had no bearing on behavior. He coined the term *Cognitive Psychology* in his 1967 book.

- **Cognitive psychologists** used mathematical and computer models to illuminate mental processes leading to observable behavior.

- **Behavioral v. Cognitive Approaches to Psychology**: The differences between the two can be understood by looking how each explains the development of language in children. Behaviorists like Skinner believe children acquire language in response to feedback. Linguist Noam Chomsky proposed that people are born with innate mechanisms for learning language. Consider: Can these both be correct? Why or why not?

**Clinical Roots: Freud and the Humanists**

- **History of Treatment**
  - Throughout history, *psychological disorders* were largely understood to be *supernatural forces* at work, and thus, there were no known effective treatments.
  - Improvements in science led to more natural explanations, but did little to lead to effective treatments. People with disorders were experimented on, often using dangerous and harmful methods, e.g., insulin shock.
  - Between the 17th and 19th centuries, two scientific approaches, a medical model, and a psychological model, replaced the supernatural explanations.
  - *Medical model*: emphasizes physical causes of atypical behavior and medical treatments, e.g., pharmaceuticals.
  - *Psychological model*: suggests that atypical behavior can result from life experiences, leading to maladaptive responses (fear, anxiety, anger, etc.)
  - *Psychological treatment*: ranges from offering support to applying cognitive and behavioral methods to help people think and problem solve in new ways.

- **Sigmund Freud** (1856-1939)
  - Trained as a physician, he formed a theory of the impact of life experiences on behavior known as *psychodynamic theory*.
  - Freud formulated ideas and wrote about the existence of an unconscious mind, the development of sexuality, dream analysis, and the psychological roots of abnormal behavior, and developed techniques for treating disorders. It is the classic view of therapy, an authoritarian approach in which the doctor sat in “the big chair” (Tears for Fears song “Shout” in
Songs from the Big Chair Album) and was all knowing in his interpretations.

- Freud did no real experimentation. His ideas are based on his thinking and anecdotal work with patients, mostly upper-class Viennese women who were not representative of the general population and are even less representative now. Still, some of his ideas hold up to contemporary scientific scrutiny.

- **Humanistic Psychology:** In the 1960s, American psychology was largely dichotomized between psychodynamic theory and behaviorism. The humanists grew out of a reaction against the limitations of these two theories.

  - Humanists extended the work of philosopher Jean Jacques Rousseau into a belief that people are innately good, motivated to improve themselves, and only behave badly when corrupted by society.

  - Abraham Maslow (1908-1970) introduced a theory of motivation, the primary goal of which is self-actualization—to be one’s best self.

  - Carl Rogers (1902-1987) developed a client-centered approach to therapy, placing the individual undergoing treatment on equal standing with the therapist, taking an active role in their treatment. Unconditional love and mirroring are two principle approaches employed in client-centered therapy.

### IV. WHAT ARE PSYCHOLOGICAL PERSPECTIVES?

**Objective**

- LO4: Differentiate the seven major perspectives of modern mainstream psychology in terms of typical research questions, research methods, and focal causes of behavior.

1. **What Are Psychological Perspectives?**

   - A **psychological perspective** is an understanding of behavior from a specific point of view.

   - Psychologists often define themselves in terms of their perspective, indicating their area of specialization (e.g., social psychologist, developmental psychologist).

   - Graduate departments of psychology are typically organized by orientation, so that students may develop expertise in this area. At the same time, many Psychologists lay claim to 2-3 approaches in their research and orientations.

   - You Professor, Dr. Charlotte takes a primarily Cognitive Developmental, Individual Differences approach. This mix is increasingly shown to also be supportive of evolutionary perspectives.
2. **Seven Perspectives of Psychology**

- **Biological Psychology** or behavioral neuroscience
  - Focuses on the relationships between mind and behavior and their underlying biological processes
  - Methods for observing brain activity helped advance this field.
  - Using the example of memory: Biological psychology approaches memory by studying the mechanisms used to store and retrieve memories.

- **Evolutionary Psychology**
  - Attempts to answer how our bodies and minds have been shaped by the need to survive and thrive
  - Basic principle: Our current behavior exists because it provided some advantage in survival and reproduction to our ancestors.
  - Using the example of memory: Evolutionary psychologists would be interested in the fact that we have a good memory for faces, particularly of those who have cheated us in the past, because being cheated out of food would have meant starvation to our ancestors.

- **Cognitive Psychology**
  - Focuses on the process of thinking, information processing, reasoning, and problem solving
  - Using the example of memory: Cognitive psychology addresses how different types of information are processed, stored, and retrieved (e.g., remembering a date versus riding a bike), why we might have difficulty remembering, and what we can do to make our memories more efficient

- **Social Psychology**
  - Describes the effects of the social environment, including culture, on behavior
  - Basic principle: We each construct our own reality and the social environment influences our thoughts, feelings and behavior.
  - Using the example of memory: Social psychologists might investigate how being in the presence of others influences the storage and retrieval of data.

- **Developmental Psychology**
  - Explores the normal changes in behavior that occur across the lifespan
  - Using the example of memory: Developmental psychologists might look at age-related changes in memory.

- **Clinical Psychology**
  - Seeks to explain, define, and treat abnormal behaviors and promote well-being
Using the example of memory: Clinical psychology is concerned with how psychological disorders impact memory, e.g., traumatic experiences that create intrusive flashbacks.

- Individual Differences (Personality) Perspective
  - Recognizes and investigates individual differences in personality
  - Using the example of memory: Individual differences in “need for cognition” can predict memory for verbal material.

V. WHAT DOES IT MEAN TO BE A PSYCHOLOGIST?

Objective

- LO6: Explain why psychology’s role as a “hub science” allows psychologists to pursue a wide range of career paths with respect to professional specialties and research areas.

- Note: In 2006-2007, more than 90,000 students in the U.S. received bachelor’s degrees in psychology.

1. Degrees in Psychology
   - An undergraduate degree allows one to seek employment in diverse fields related to psychology, such as working in a research facility, rehabilitation center, management, sales, service, public affairs, education, human resources, etc. This reflects the “hub” nature of the science.
   - A master’s degree (two years beyond a bachelor’s) allows one to teach in a two-year institution and, in many states, become licensed as a therapist. Master’s level psychologists work in the healthy industry and education fields, including school psychologists who may assess students for academic and psychological service needs and/or counsel students.
   - A doctoral degree (2-5 years beyond a master’s) allows one to teach and conduct research at colleges and universities (less than 28%), work as therapists (40%), or other fields such as business, government, and schools.

2. Doctoral-Level Psychology
   - Those pursing a doctoral degree typically focus on a particular perspective, taking coursework in their area of specialization.
   - Not all people who receive a doctorate in psychology do clinical work.
   - Doctoral students who want to do clinical work have internships in clinical settings and undergo supervised training prior to government-regulated licensure that adds another year to their graduate studies.
• Psychologists differ from psychiatrists in that they are not medical doctors and, typically, cannot prescribe medication (currently only allowed in New Mexico and Louisiana).

VI. INTERPERSONAL RELATIONSHIPS FROM THE PSYCHOLOGICAL PERSPECTIVE, AN ONGOING THEM THROUGHOUT THIS COURSE!

Relationships as a Lens

Objective

- LO5: Analyze the ways in which the seven major perspectives can be integrated to address a single psychological problem or topic.

Consider and issue that students may frequently encounter regarding relationships (e.g., the psychological issues involved with sharing a small dorm room for the first time, or having a tendency to feel secure or insecure in a first romantic relationship,…)

How one psychologist might approach this topic given their perspective. After each person has had a turn, the group should debate the ways in which each of the seven perspectives clarify this issue more fully. Do some perspectives seem more applicable than others?

Chapter Two — The Measure of Mind: Methods of Psychology
Objective

- LO1: Describe the criteria that distinguish scientific observation and reasoning from casual, everyday thinking.

**FUN Resources and Materials:**

- Really? The New York Times Well blog. [This blog challenges (or validates) common assumptions by exploring the scientific research on a subject.]
  - http://well.blogs.nytimes.com/2012/01/02/really-the-claim-listening-to-music-can-relieve-pain/
- “Really? Does the Pill Cause Weight Gain?,” Tara Parker-Pope.
  - http://well.blogs.nytimes.com/2011/01/05/can-you-be-addicted-to-foods/

**WHAT IS SCIENCE?**

Objectives

- LO1: Describe the criteria that distinguish scientific observation and reasoning from casual, everyday thinking.
- LO2: Articulate how science uses testable and falsifiable hypotheses, data collection, peer review, and replication to evaluate theories explaining psychological phenomena.
3. **What Is Science?**
   - **Science** requires *evidence*, as opposed to “faith,” which is belief that is based on trust and does not require evidence.
   - Science comes from the Latin *scientia*, which means “knowledge.”
   - Science refers specifically to a specific way of learning about reality through **systematic observation and experimentation**.

4. **The Scientific Mindset**
   - Science relies on **objectivity**. *Objectivity* means that conclusions are based on facts, without the influence of personal emotions or biases.
   - *Subjectivity* refers to conclusions that reflect a personal point of view.
   - Observation of another human being is typically subjective—personal accounts of the same event can vary greatly, based on how the facts are processed by an individual.
   - Scientific methods promote objectivity and help prevent biased, subjective observations from distorting the facts.
   - Scientific methods use **systematic observation** as opposed to “hit or miss” *observation*. The latter involves making conclusions based on the events and people around us, which is not necessarily representative of larger society. (NOTE: You may not want to mention hit or miss observations until you conduct Exercise 2.7: *Everybody’s Doing It*.)
   - Science relies on **observable, repeatable evidence**. Every day, observation often ignores evidence, particularly that which does not support firm beliefs.
   - New data is always contributing to our understanding. One tenet of scientific literacy is that scientific knowledge is always open to improvement and may never be absolutely certain.

5. **The Gold Standard**
   The “gold standard” for demonstrating the objective effects of a substance or treatment is the **double-blind procedure**.
   - Participants do not know if they are taking a real substance or a placebo. This controls for any effects of participant’s expectations.
   - A **placebo** is an inactive substance that cannot be distinguished from real, active substances.
   - The researcher does not know if a participant has been given a real substance or a placebo until the experiment is over, so as not to bias the researcher.
   - Using the double blind procedure allows the research to indicate whether changes in the research subject can be attributed to the substance (or
treatment), or if changes are not significantly different than when taking the placebo.

**Exercise 2.6: The Gold Standard**

**Objective**
- LO1: Describe the criteria that distinguish scientific observation and reasoning from casual, everyday thinking.

Consider a psychology study that employs a double-blind procedure and one that doesn’t. (Dr. Reyes’ participation in a Depression During Pregnancy study at Stanford.)

**Reflections:**
- What are some of the difficulties in conducting double-blind studies in psychology?
- What might be some of the ethical considerations?

**The Importance of Critical Thinking**

**Objectives**
- LO1: Describe the criteria that distinguish scientific observation and reasoning from casual, everyday thinking.
- LO2: Articulate how science uses testable and falsifiable hypotheses, data collection, peer review, and replication to evaluate theories explaining psychological phenomena.

**The Importance of Critical Thinking**
- **Critical thinking** is the ability to thinking clearly, rationally, and independently. It is essential to scientific reasoning.
- A critical thinker can follow logical arguments, identify faulty reasoning, prioritize ideas by importance, and apply logic to forming opinions, attitudes, and values.
- To develop the skill of critical thinking, apply the following questions to evaluate new information you encounter:
  - What am I being asked to believe or accept?
  - What evidence supports this position?
  - Are there other ways this evidence could be interpreted?
  - What other evidence would I need to evaluate these alternatives?
  - What are the most reasonable conclusions?
• Signs that one is not thinking critically include:
  ▪ Preferring to be given the answer, rather than figuring out a problem yourself
  ▪ Preferring to rely on gut feelings about decisions, rather than on reasoning
  ▪ Being unwilling to change your mind in the face of contradictory evidence, or refusing to review mistakes
  ▪ Resenting criticism of your ideas
Exercise: An Investigation into the Vaccine-Autism Controversy

Objective

- LO1: Describe the criteria that distinguish scientific observation and reasoning from casual, everyday thinking.

Resources and Materials

- Access to the Lancet study

- Related videos, radio broadcasts, and articles

Many parents decline to vaccinate their children, or do so on an alternative schedule, because of this study. Wakefield drew an association between the Measles Mumps Rubella vaccine (MMR) and the development of autism in children. Since that time, there has been a resurgence of measles that had been all but eradicated.

Apply each of the five critical thinking questions from their textbooks:

a. What am I being asked to believe or accept?

b. What evidence supports this position?
c. Are there other ways this evidence could be interpreted?
d. What other evidence would I need to evaluate these alternatives?
e. What are the most reasonable conclusions (at this time)?

Reflections
- Would you give your own child this vaccination, based on everything you have read, viewed and heard? Why or why not? Does this differ from what you would advise someone else to do? Why or why not?

The Scientific Enterprise

Objectives
- LO1: Describe the criteria that distinguish scientific observation and reasoning from casual, everyday thinking.
- LO2: Articulate how science uses testable and falsifiable hypotheses, data collection, peer review, and replication to evaluate theories explaining psychological phenomena.

1. Scientific Theories
- **Theories** are sets of facts and relationships between facts that can be used to explain and predict phenomena. Scientists seek to develop and test theories.
- Scientific theories should not be confused with colloquial uses of the term to mean “guess” or a hypothetical situation. The best theories generate new predictions as well as explain and organize facts.
- A scientific **prediction** is typically given in a rigorous, mathematical form that allows the scientist to state that under a certain set of circumstances, certain outcomes are likely to occur.
- A **hypothesis** is an educated guess that must be falsifiable and testable.
- **Falsifiable** means that you can imagine situations that demonstrate your hypothesis to be false.
- **Testable** means you can evaluate the hypothesis using known scientific methods.
- Hypotheses can never be proven to be true because future information and methods may show the hypotheses to be false. All we can do is determine when a hypothesis is false (and thus discarded).
- Testing and developing a theory:
  - Generate a hypothesis (e.g., a causal mechanism or mathematical relation).
  - Formulate a testable prediction.
  - Conduct systematic observation (experimental or non-experimental).
• Reject or accept the hypothesis. Accepted hypotheses contribute to the theory and help generate new hypotheses.

2. **Evaluating Hypotheses**
   • After developing a falsifiable and testable hypothesis, scientists collect data to evaluate the hypothesis.
   • Science is a collaborative enterprise—new hypotheses are generated based on previous work, and the scientific community is called upon to scrutinize scientific work through a process of **peer review**. It is added to the existing body of information only if other experts in the field validate the study’s importance.
   • Other scientists attempt to reproduce study results by **replicating** these studies. If data is replicated, it is quickly accepted into the body of research.

**HOW DO PSYCHOLOGISTS CONDUCT RESEARCH?**

**Descriptive Methods**

**Objective**
- LO3: Explain the main goal of descriptive research methods and the ways in which case studies, naturalistic observations, and surveys approach this goal.

1. **How Do Psychologists Conduct Research?**
   • Psychologists use a variety of methods; descriptive, correlational, and experimental methods are examples.
   • Descriptive methods (surveys, case studies, and observations) are often the starting place for a new research question.
   • Correlational methods help describe how two variables relate to one another.
   • Experimental methods allow psychologists to test their hypotheses and to determine the causes of behavior.
   • Each method has strengths and weaknesses and requires different types of statistical analysis.
   • Scientists have greater confidence in their results when they are repeated using multiple methods.

2. **Descriptive Methods**
   • **Case study**: An in-depth analysis of behavior of one person or a small number of people. Interviews, background records, observation, tests and brain imaging can be used to provide information for the case study.
     - **Advantages**: Can be used when large numbers of participants are not available or a particular participant possesses unique characteristics; can use gathered data to generate and test hypotheses.
Disadvantages: Is limited in generalizing results to larger populations

Naturalistic observation: An in-depth study of a phenomenon in its natural setting.

Advantages: By looking at a larger group, strengthens ability to be applicable to the general population; able to observe people in their everyday settings, rather than in a lab

Disadvantages: May alter behavior if people are aware they are being observed; observing while people are not aware raises ethical concerns

Survey: Questionnaire that allows researchers to ask many people questions about their attitudes and behavior.

Advantages: Provides a lot of useful information at a low cost; may have generalized results when given to a large sample or subset representative of a population being studied

Disadvantages: Uses self-report, so responses and results can be influenced by people’s desire to appear socially appropriate

Exercise:
- Suppose you wanted to study the effects of exercise on mood—which of the three methods might you select and why? What would be the goal?
- Suppose you wanted to understand the characteristics of serial killers—which method would you use, and why? What would be the goal?
- Suppose you wanted to study the role of stress in the eating habits of college students—which method might you use then and why? Again, what would be the goal?

Lecture: Correlational and Experimental Methods

Objective
- LO4: Differentiate the key features, strengths, and limitations of correlational and experimental methods, and apply this distinction in designing a new study or interpreting the results of a study.

1. Correlational Methods
- Correlational methods: Measure the direction and strength of relationship between two variables
- Variable: Factors that have values and can vary like a person’s height or weight
• A **measure** of a variable expresses how much of the variable you have observed. After measures of each variable are obtained, they are compared by conducting a statistical analysis of the results.

• **Three potential outcomes:** Positive, negative, or zero correlations.
  - Positive correlation: High levels of one variable are associated with high levels of the other variable (e.g., height and weight)
  - Negative correlations: High levels of one variable are associated with low levels of the other variable (e.g., alcohol consumption and GPA)
  - Zero correlation: Two variables do not have any systematic relationship with each other (knowing the variable of one does not tell you anything about the variable with other) (e.g., crime rates and full moon)

• **Correlation is not causation:** We can know there is a relationship between the two variables but we cannot know if one variable causes the other.
  - The relationship may be caused by a third variable
  - The variables may be influencing each other simultaneously

• **Why use it?**
  There are times where it would be impossible or unethical to use experimental methods with humans and ask them to place themselves at risk, but we can draw correlations between existing behaviors in people and their functioning or health.

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**Correlation Is Not Causation!**

**Objective**

- LO4: Differentiate the key features, strengths, and limitations of correlational and experimental methods, and apply this distinction in designing a new study or interpreting the results of a study.

**Lecture—Experimental Methods (continued)**

2. **Experimental Methods:** When conducting an experiment, the researcher has a great deal of control over the variables and context. Experiments allow researchers to talk about cause.
  - Begins designing an experiment with a **hypothesis:** “If I do this, then that will happen.” To test the hypothesis, the researcher manipulates or modifies one or more variables and observes changes in others
  - The variable controlled by the experimenter is the **independent variable.**
  - The **dependent variable** is the observed result of the manipulation of the independent variable.
  - Participants get assigned to one of two groups:
    - **Control group:** The group that experiences all experimental procedures with the exception of exposure to the independent variable
Experimental group: The group that does experience the independent variable

- To prevent individual differences from masking or distorting the effects of the independent variable, participants are randomly assigned to the control or experimental group. Each participant has an equal chance of being assigned to either group.

- Confounding variables: Variables that are irrelevant to the hypothesis being tested, such as individual differences among participants that can alter conclusions

- Limitations:
  - Experiments can be artificial; people may change their behavior if they know they are participants in a study. Variables may also not truly represent real-life variables.
  - Making a study realistic has ethical challenges in that it could physically or psychologically harm participants.
  - Independent and dependent variables must be operationalized; that is, they can be defined and implemented in a concrete fashion. Different researchers operationalize variables in different ways. Thus, methods can vary widely from study to study.

3. Meta-analyses: A statistical analysis of many previous experiments on the same topic. Typically it proves a clearer picture of the phenomenon being studied than

VII. HOW DO WE STUDY THE EFFECTS OF TIME?

Cross-Sectional and Longitudinal Methods

Objective

- LO5: Compare and contrast cross-sectional versus longitudinal methods for studying change in psychological processes over time.

1. Cross-sectional study: Gathers groups of people of varying ages and assess age-related changes. Data are simultaneously obtained from people of differing ages.

  - Advantages: The study is looking at a slice of time; subjects are not followed over long periods of time
  - Disadvantages: Cohort effects—there may be generational effects of having been born at a particular point in history, which could confound the data (e.g., kids who never lived without the Internet might respond differently to violent video games than today’s 40-year-olds for reasons other than age)

2. Longitudinal study: A single group of people is observed over a long period of time.

  - Advantages: Reduces cohort effects
• **Disadvantages**: Expensive; time-consuming; participants may drop out due to lack of incentive or moves (impacting the size and how representative a sample you have)

3. **Mixed longitudinal design**: Combines cross-sectional and longitudinal methods. Participants from a range of ages are observed for a limited period of time (approximately five years).

• **Advantages**: Faster and less expensive than longitudinal method; avoids some of the cohort effects of pure cross-sectional design
• **Disadvantages**: Still retains some of the disadvantages of each (e.g., drop out problem; still has higher costs and time associated with it)

*Imagine that you are conducting a study on the effects of 9/11 on school-age children who lived in lower Manhattan. Which would you choose: a cross-sectional, longitudinal, or mixed study design? Why? What would be the benefits and drawbacks of selecting this method?*

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**HOW DO WE DRAW CONCLUSIONS FROM DATA?**

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**Lecture: Reliability and Validity**

**Objective**

- LO6: Define reliability and validity, and evaluate a specific operational measure of a variable with respect to these criteria.

1. **The Importance of Valid and Reliable Measures**:  
   • **Validity**: The instrument measures what it was designed to measure. To check validity, determine if it correlates with established, existing measures of the same concept.
   • **Reliability**: Refers to the consistency of a measure.  
     - **Test-retest reliability**: Scores are likely to stay the same when re-tested by the same measure  
     - **Inter-rater reliability**: Consistency in the interpretation of a measure across different observers  
     - **Inter-method reliability**: Correlates positively with other instruments that measure a feature of an individual (e.g., intelligence)  
     - **Internal consistency**: Items within a single test that measure a particular construct positively correlate with each other  
   • Reliability is not the same thing as validity. You can obtain a consistent result (reliability) that lacks meaning (validity), but a measure cannot be valid without also being reliable

**Lecture Lens: Stats**
Objective

- LO7: Differentiate the kind of information conveyed by descriptive versus inferential statistics in describing scientific data, and interpret the meaning of specific statistics (e.g., mean, correlation coefficient).

2. Descriptive Statistics

- Descriptive statistics help researchers organize individual units of data into meaningful patterns and summaries, literally “describing” the data.

- **Descriptive statistics** only tell us about the sample we have studied (to apply to the general population requires other methods)

- **Frequency distribution**: Can arrange scores from high to low and look at how many people obtained each score. This can be illustrated with a bar chart or histogram.

- **Measures of Central Tendency**: Mean, Median, and Mode
  - **Mean**: The numerical average of a set of scores, computed by adding all scores together and dividing by the number of scores.
  - **Median**: Represents the half-way mark in a data set, with half of the scores falling above and half falling below. It is less affected by extreme scores or outliers than the mean, which averages them in. It is useful when you have some very extreme scores that would impact the mean, making it a poor “summary” of the data.
  - **Mode**: Occurs to the most frequently occurring score, and is easy to determine from looking at a histogram.

**Exercise: Data Abuse**

To get a better sense of how descriptive statistics can be used to “abuse” data, visit and read:


Find, analyze, and critique a statistical claim in a real advertisement (either online or in print media), based on this information. Consider bringing it in to share!

**Descriptive Statistics (continued)**

- **Variability** refers to how clustered the scores are.

- **Standard Deviation (SD)** tells you how tightly a group of scores cluster around the mean. A smaller SD means that more scores are found closer to the mean and a larger SD means that scores are more spread out away from the mean. To calculate SD, subtract each score from the mean, square each difference, add the
squares, divide by the total number of scores, and take the square root of the result.

• **Normal Curve:** A figure that illustrates how scores fall in any given population: 68% of the population falls within one standard deviation of the mean, 95% falls within two standard deviations, and 99% of the population falls within three standard deviations. This allows one to know where a score falls relative to the general population

• **Descriptive Statistics with Two Variables**
  - When looking at the relationship between multiple variables, you can illustrate with a scatter plot. Each dot represents the intersection between scores on two variables of interest (e.g., shoe size and height).
  - You can compute the relationship using a correlation coefficient, which ranges from +1.00 to -1.00.
  - **Zero correlation:** The two variables have no systematic relationship at all. The farther the correlation is from zero, the stronger the relationship.
  - **Positive Correlation:** When one factor occurs, the other factor is very likely to occur.
  - **Negative Correlation:** When one factor increases, the other decreases.

3. **Inferential Statistics:** Statistical methods that allow experimenters to extend conclusions from samples to larger populations, i.e., what the results might mean more generally if we find a “difference between two or more groups”

**Statistical significance:** In order to declare that an intervention shows an effect, or that some difference between groups is “real” it has to be statistically significant, that is, there is only a five out of 100 chance that an observed difference is possible by chance

(\( p < .05 \) as the “gold standard” here). We say that statistically significant means “Not likely due to chance!”

**Exercise: The Home Field Advantage**

To get a better sense of how inferential statistics “work” in a everyday intuitive example like baseball (We won’t actually compute any at this time) watch William Spaniels

http://www.youtube.com/watch?v=PE-W1heMZIU

**VIII. RESEARCH ETHICS**

**Objective**

- LO8: Evaluate specific psychology studies in terms of the ethical guidelines for using human and animal participants in research.
1. **Research Ethics**
   - **Institutional Review Board (IRB):** Researchers working in universities and other agencies receiving federal funding must receive the approval of IRBs for human participant research and institutional animal care and use committees (IACUCs) before conducting research.
     - They must include one member of the community outside of the institution or agency to ensure the research is not conducted in secret.
     - They are guided by federal regulations and research ethics endorsed by professional societies (e.g., American Psychological Association).
     - These procedures do not extend to institutions that aren’t federally funded such as private corporations.

2. **Human Participants:** At the core of ethical standards for human research is that participation is voluntary.
   - **Reasonable Incentives:** Pay or extra credit for participation must not be so extreme that they become a primary motivation for prospective volunteers.
   - **Informed Consent:** Researchers must provide prospective participants with a form that details the purpose of the study and what types of procedures will occur.
     - This is sometimes complicated by whether the person is limited in his/her ability to provide informed consent (often for the same reasons that person is being studied, e.g., children, people with schizophrenia, or those with late-stage Alzheimer’s). The IRB evaluates these ethical dilemmas case-by-case.
   - **Do No Harm:** Researchers must take care that no harm comes to participants.
     - Sometimes, mild deception is necessary to conduct a study (blinding the participant to the true purpose of the study so that person won’t alter behavior). Afterwards, researchers must take care to debrief the participant.
     - Treatment must not be withheld: Consider the Tuskegee experiment in which 400, impoverished African-American men who contracted syphilis were denied penicillin in order to study the progression of the disease.
   - **Private and Confidential**
     - Participants must have control over the degree to which their information is shared (e.g., medical records)
     - Confidentiality refers to the participants’ rights to not have their information revealed to others without obtaining consent from the participant. It is maintained by substituting codes for names and locking away data.

3. **Animal Subjects:** Use of animals as research subjects is still hotly debated.
• **Prevalence:** Currently 7-8% of the published psychology research in journals involves the use of animals as research subjects; 90% of animals used are rodents and birds; and 5% or less involves monkeys and other primates. Use of cats and dogs is rare.

• **Necessity:** Research using animals must demonstrate a clear purpose, such as benefiting health of humans or other animals

• **Care:** Animals must receive excellent housing, food, and veterinary care.

• **Suffering:** Pain and suffering must be minimized. The APA provides guidelines for use of pain, surgery, stress, and deprivation with animal