



# CHAPTER 1

SCIENTIFIC UNDERSTANDING  
OF BEHAVIOR

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# LEARNING OBJECTIVES

- ✓ Describe why an understanding of research methods is important
- ✓ Describe the scientific approach to learning about behavior and contrast it with pseudoscientific research
- ✓ Define and give examples of the four goals of scientific research:
  - ✓ Description
  - ✓ Prediction
  - ✓ Determination of cause
  - ✓ Explanation of behavior

# LEARNING OBJECTIVES

- ✓ Discuss the three elements for inferring causation:
  - ✓ Temporal order
  - ✓ Covariation of cause and effect
  - ✓ Elimination of alternative explanations
- ✓ Define, describe, compare, and contrast basic and applied research

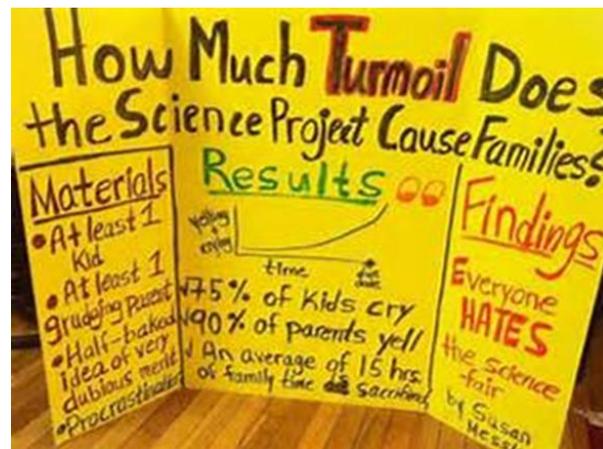
# IMPORTANCE OF RESEARCH METHODS

- Scientific research has become prominent in public policy and judicial decisions
  - Behavioral research, developmental psychology, and neuroscience have influenced U.S. Supreme Court decisions
  - Universities offer degrees in public policy:
    - Berkeley offers a Masters of Public Policy (MPP)
    - Example: Berkeley's research in this area:  
<https://gspp.berkeley.edu/research>



# IMPORTANCE OF RESEARCH METHODS

- Developing and assessing the effectiveness of goal-oriented programs
  - Examples:
    - Drug Abuse Treatment Programs
    - Teen Pregnancy Prevention Programs
    - Educational Programs
    - Governmental Programs for Social Services



## Interesting/Bizarre Research Studies

- Self-control consumes glucose in the brain. They also found an indirect relationship between diabetes and low self-control. States with high diabetes rates also had high crime rates. Countries with a different condition that leads to low glucose levels had higher killing rates.
- Classic research has suggested that the more people doubt their own beliefs the more, paradoxically, they are inclined to proselytize in favor of them.
- People remember information that is hard to master. In a study for Cognition, it was found that information in hard-to-read fonts was better remembered than information transmitted in easier fonts.

## Interesting/Bizarre Research Studies

- Physical contact improves team performance in sports
  - Teams that touched each other frequently early in the 2008-2009 season did better than teams that touched less frequently, even after accounting for player status, preseason expectations, and early season performance.
- There is a surprisingly strong relationship between daylight saving time and lower SAT scores.
  - No explanation was offered in the study.
- A study investigated whether gun shows increase crime rates. They identified 3,400 gun shows in Texas and California and looked at crime rates for the areas around the shows for the following month.
  - They found no relationship between gun shows and crime in either state.

# IMPORTANCE OF RESEARCH METHODS

- Many occupations require the use of research findings
  - Businesses are drowning in data
    - They need professionals who know how to analyze and interpret it.
    - It drives important business and budget decisions
- Informed citizens need knowledge of research methods for everyday decisions
  - People have always observed the world around them and sought explanations for what they see and experience.
  - However, instead of using a scientific approach, many people rely on **intuition** and **authority** as ways of knowing.

# IMPORTANCE OF RESEARCH METHODS

- **Intuition:** Many people are all too ready to accept anything they learn from the Internet, news media, books, government officials, celebrities, religious figures, or even a professor.
- The problem: the statements may not be true.
- The **scientific approach** rejects the notion that one can accept on faith the statements of any authority; more evidence is needed before people can draw scientific conclusions.
  - *It provides an objective set of rules for conducting research (such as how to gather, evaluate, and report on data)*
  - *However, the scientific approach to acquiring knowledge does use **intuition** and **authority** as sources of ideas about human behavior*

# WAYS OF KNOWING

- Limitations of intuition
  - *Relies unquestioningly on personal judgment*
  - Involves cognitive and motivational biases
    - Erroneous conclusions about cause and effect
    - Illusory correlation - Cognitive bias that occurs when we focus on two events that stand out and occur together (it's how superstitions start)

# WAYS OF KNOWING

- **Skepticism:** Ideas must be evaluated on the basis of careful logic and results from scientific investigations
  - The fundamental characteristic of the scientific method is empiricism.
- **Empiricism:** Idea that *knowledge is based on observations*
  - Hence it is the term scientists use to describe their work: *Empirical Studies/Research/Journals*

## GOODSTEIN'S (2000) EVOLVED THEORY OF SCIENCE

- Data play a central role
  - For scientists, knowledge is primarily based on observations. Scientists enthusiastically search for observations that will verify or reject their ideas about the world. They develop theories, argue that existing data support their theories, and conduct research that can increase their confidence that the theories are correct.
- Scientists are not alone
  - They make observations that are accurately reported to other scientists and the public. Many other scientists will follow up on the findings by conducting research that replicates and extends these observations

## GOODSTEIN'S (2000) EVOLVED THEORY OF SCIENCE

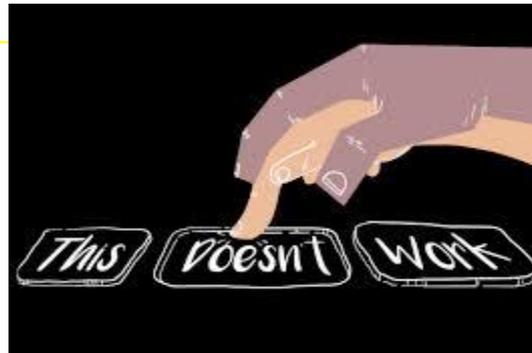
- Science is adversarial
  - *It is a way of thinking in which ideas do battle with other ideas in order to move ever closer to truth.*
  - Some ideas, may prove to be wrong if research fails to provide support for them. Good scientific ideas can be supported or they can be falsified by data from others
  - **Falsifiability:** *Testable scientific ideas that can be falsified by data.*
- Scientific evidence is peer reviewed
  - Before a study is published in a top-quality scientific journal, other scientists who have the expertise to carefully evaluate the research review it. This process is called **peer review:**
    - *Process of evaluation of the research to determine whether it is published in a journal*

## GOODSTEIN'S (2000) EVOLVED THEORY OF SCIENCE

- However there are recent concerns that research is not undergoing the proper scrutiny or “peer review” that is needed.
  - For example: Priming is the idea that decisions can be influenced by apparently irrelevant actions or events that took place just before the cusp of the choice.
  - “Dr. Kahneman and a growing number of his colleagues fear that a lot of this priming research is poorly founded. Over the past few years various researchers have made systematic attempts to replicate some of the more widely cited priming experiments. Many of these replications have failed.
  - “The idea that the same experiments always get the same results, no matter who performs them, is one of the cornerstones of science’s claim to objective truth.”
  - This is one of many examples where flawed data was published in prestigious journals and publications.
  - Article: “Trouble at the Lab: Scientists Like to Think of Science as Self-Correcting. To an Alarming Degree, it is Not”:
    - <http://www.economist.com/news/briefing/21588057-scientists-think-science-self-correcting-alarming-degree-it-not-trouble/>

# WAYS OF KNOWING

- There is nothing wrong with having opinions or beliefs as long as they are presented simply as opinions or beliefs.
- However, people should always ask whether the opinion can be tested scientifically or whether scientific evidence exists that relates to the opinion. People should also be skeptical of pseudoscientific research.
- **Pseudoscience:** *Fake science in which scientific terms and demonstrations are used to substantiate claims that have no basis in scientific research*
- Example: Facilitated communication - Procedure used by therapists working with children with autism



# GOALS OF BEHAVIORAL SCIENCE

Scientific Research on Behavior has Four General Goals

## 1. **Describe behavior**

- *The scientist begins with careful observation, because the first goal of science is to describe behavior—which can be something directly observable or something less observable.*
- Also, researchers are often interested in describing the ways in which events are systematically related to one another.
- In science, descriptions are systematic and precise. It makes use of **operational definitions**.

# GOALS OF BEHAVIORAL SCIENCE

- An **operational definition** is a result of the true operationalization of a study variable, and is used to *define* something (e.g. a variable, term, or object) in terms of a process (or set of validation tests) needed to determine its existence and its physical properties such as duration, quantity, extension in space, chemical composition, etc.
  - Since the degree of operationalization can vary itself, it can result in a more or less operational definition.
  - The procedures included in definitions should be repeatable by anyone or at least by peers.

# GOALS OF BEHAVIORAL SCIENCE

## 2. **Predict behavior**

- Once it has been observed with some regularity that two events are systematically related to one another, it becomes possible to make predictions. One implication of this process is that it allows us to anticipate events.
- Descriptions of events often provide a basis for prediction.
- Predictions are sometimes made in the form of hypotheses, which are tentative, testable predictions concerning the relationships between or among variables.

# GOALS OF BEHAVIORAL SCIENCE

- Prediction of later performance is of particular importance to researchers. For example:
  - Does eating a low-calorie diet increase chances of living longer?
  - Does undergraduate GPA predict how well one will do in graduate school?
  - Do high levels of intelligence predict avoidance of cognitive biases?
- When a variable can be used to predict another variable or variables we can say the variables are correlated. Correlation exists when different measures vary together, which makes it possible to predict values of one variable by knowing values of another variable.

# GOALS OF BEHAVIORAL SCIENCE

## 3. Determine the causes of behavior

Cook and Campbell describe three types of evidence (drawn from the work of philosopher John Stuart Mill) used to identify the cause of a behavior. To conclude causation, three things must occur:

- **Temporal precedence:** *Temporal order of events in which the cause precedes the effect*
- **Covariation of cause and effect:** *Effect occurs only in the presence of cause. That is, when the cause is present, the effect occurs; when the cause is not present, the effect does not occur.*
- **Elimination of alternative explanations:** *Nothing other than causal variable could be responsible for the observed effect*

# GOALS OF BEHAVIORAL SCIENCE

## 4. Explain behavior

- A final goal of science is to explain the events that have been described. The scientist seeks to understand *why* the behavior occurs.
- In a nutshell, science seeks to understand the *why* of behavior.
- **In Review:**
- In many ways, these 4 objectives are similar to the kinds of things you probably do every day as you interact with others. When dealing with a child, for example, you might ask questions like "What is he doing?" (describing), "What would happen if I responded in this way?" (predicting), "What caused him to behave that way?" (Cause), and "Why is he doing that?" (explaining).

# BASIC RESEARCH

- **Basic research**

- *Attempts to answer fundamental questions about the nature of behavior*
- *It advances Psychological Theory*
- *Typically conducted at universities*
  - In universities, studies are often designed to address theoretical issues concerning phenomena such as cognition, emotion, motivation, learning, neuropsychology, personality development, and social behavior

# BASIC RESEARCH

- For example, basic science investigations probe for answers to questions such as:
  - How did the universe begin?
  - What are protons, neutrons, and electrons composed of?
  - How do slime molds reproduce?
  - What is the specific genetic code of the fruit fly?



# APPLIED RESEARCH

- **Applied research**

- *Conducted to address issues in which there are practical problems and potential solutions*
- *A major area of applied research is called **program evaluation**, which assesses the social reforms and innovations that occur in government, education, the criminal justice system, industry, health care, and mental health institutions.*
  - *Typical of the research conducted in industry*

# APPLIED RESEARCH

- For example, applied researchers may investigate ways to:
  - improve agricultural crop production
  - treat or cure a specific disease
  - improve the energy efficiency of homes, offices, or modes of transportation

# BASIC AND APPLIED RESEARCH

- **Comparing basic and applied research**
- *Most scientists believe that a basic, fundamental understanding of all branches of science is needed in order for progress to take place. In other words, basic research lays down the foundation for the applied science that follows.*
  - *Neither is considered superior to the other*
  - *Applied research is often guided by theories and findings of basic research*
  - *Findings in applied settings often require modification of existing theories and spur more basic research*
  - *Basic research is crucial to public policy*

# LAB

1. Demonstration Survey
2. Open the “Scientific Understanding of Behavior” worksheet, type out your answers to the questions, and submit it to Blackboard. **Due before class next Tuesday.**