Thinking Critically With Psychological Science

Chapter 1

The Need for Psychological Science?

- Did We Know It All Along? Hindsight Bias
- Overconfidence
- The Scientific Attitude
- Critical Thinking

How Do Psychologists Ask and Answer Questions?

- The Scientific Method
- Description
- Correlation
- Experimentation

Statistical Reasoning in Everyday Life

- Describing Data
- Making Inferences

Frequently Asked Questions About Psychology

Why Do Psychology?

1. How can we differentiate between uniformed opinions and examined conclusions?
2. The science of psychology helps make these examined conclusions, which leads to our understanding of how people *feel, think, and act as they do!*

What About Intuition & Common Sense?

Many people believe that intuition and common sense are enough to bring forth answers regarding human nature.

Intuition and common sense may aid queries, but they are not free of error.

Limits of Intuition

Personal interviewers may rely too much on their "gut feelings" when meeting with job applicants.

Taxi/Getty Images

Hindsight Bias

Hindsight Bias is the "I-knew-it-all-along" phenomenon.

After learning the outcome of an event, many people believe they could have predicted that very outcome. We only knew the dot.com stocks would plummet after they actually did plummet.

Overconfidence

Sometimes we think we know more than we actually know.

How long do you think it would take to unscramble these anagrams?

People said it would take about 10 seconds, yet on average they took about 3 minutes (Goranson, 1978).

Anagram	
WREAT	WATER
ETYRN	ENTRY
GRABE	BARGE

## The Scientific Attitude

The scientific attitude is composed of curiosity (passion for exploration), skepticism (doubting and questioning) and humility (ability to accept responsibility when wrong).

Critical Thinking

Critical thinking does not accept arguments and conclusions blindly.

It examines assumptions, discerns hidden values, evaluates evidence and assesses conclusions.

Courtesy of the James Randi Education Foundation
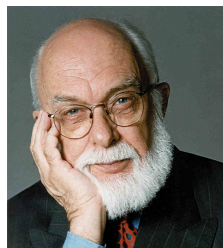
The Amazing Randi

How Do Psychologists Ask & Answer Questions?

Psychologists, like all scientists, use the scientific method to construct theories that organize, summarize and simplify observations.

Theory

A theory is an explanation that integrates principles and organizes and predicts behavior or events.

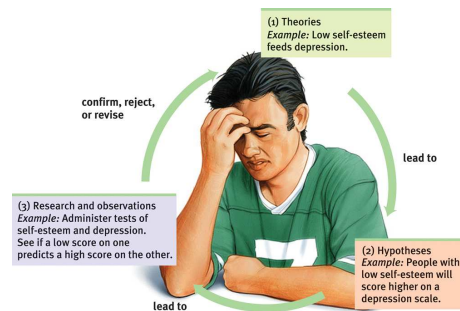For example, low self-esteem contributes to depression.

Hypothesis

A hypothesis is a testable prediction, often prompted by a theory, to enable us to accept, reject or revise the theory.

People with low self-esteem are apt to feel more depressed.

Research Observations

Research would require us to administer tests of self-esteem and depression. Individuals who score low on a self-esteem test and high on a depression test would confirm our hypothesis.

Research Process

(1) Theories
Example: Low self-esteem feeds depression.

confirm, reject, or revise

lead to

(3) Research and observations
Example: Administer tests of self-esteem and depression. See if a low score on one predicts a high score on the other.

(2) Hypotheses
Example: People with low self-esteem will score higher on a depression scale.

lead to

Description

Case Study

A technique in which one person is studied in depth to reveal underlying behavioral principles.

Susan Kuklin/ Photo Researchers

Is language uniquely human?

Survey

A technique for ascertaining the self-reported attitudes, opinions or behaviors of people usually done by questioning a representative, random sample of people.

http://www.lynnefeatherstone.org

Survey

Wording Effects

Wording can change the results of a survey.

Q: Should cigarette ads and pornography be allowed on television? (not allowed vs. forbid)

Survey

Random Sampling

If each member of a population has an equal chance of inclusion into a sample, it is called a random sample (unbiased). If the survey sample is biased, its results are not valid.
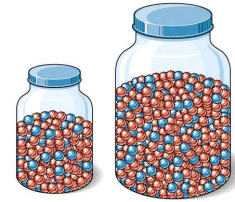
The fastest way to know about the marble color ratio is to blindly transfer a few into a smaller jar and count them.

Naturalistic Observation

Observing and recording the behavior of animals in the wild and recording self-seating patterns in a multiracial school lunch room constitute naturalistic observation.
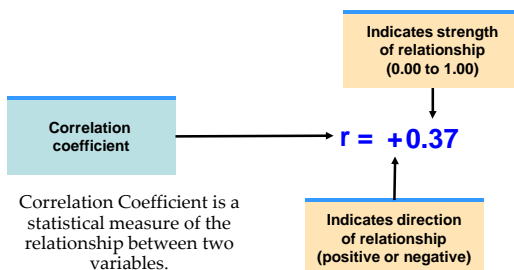
Courtesy of Gilda Morelli
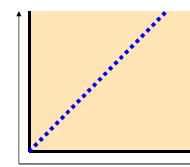
Descriptive Methods

Summary

Case studies, surveys, and naturalistic observation describe behaviors.

Correlation

When one trait or behavior accompanies another, we say the two correlate.

Indicates strength of relationship (0.00 to 1.00)

Correlation coefficient

r = +0.37

Correlation Coefficient is a statistical measure of the relationship between two variables.

**Indicates direction of relationship (positive or negative)**

Scatterplots

Perfect positive correlation (+1.00)

Scatterplot is a graph comprised of points that are generated by values of two variables. The slope of the points depicts the direction, while the amount of scatter depicts the strength of the relationship.

Scatterplots

Perfect negative correlation (-1.00)

No relationship (0.00)
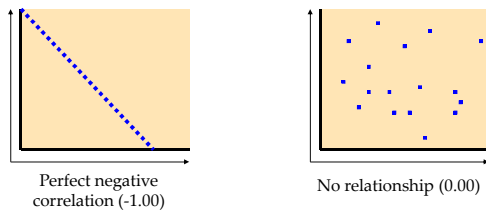
The Scatterplot on the left shows a negative correlation, while the one on the right shows no relationship between the two variables.

Data

Data showing height and temperament in people.

HEIGHT AND TEMPERAMENT OF 20 MEN

Subject	Height in Inches	Temperament
1	80	75
2	63	66
3	61	60
4	79	90
5	74	60
6	69	42
7	62	42
8	75	60
9	77	81
10	60	39

HEIGHT AND TEMPERAMENT OF 20 MEN

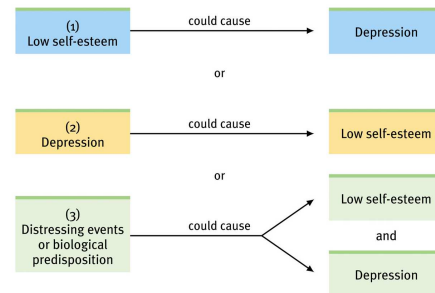| Subject	Height in Inches	Temperament
11	64	48
12	76	69
13	71	72
14	66	57
15	73	63
16	70	75
17	63	30
18	71	57
19	68	84
20	70	39

Scatterplot

The Scatterplot below shows the relationship between height and temperament in people. There is a moderate positive correlation of +0.63.
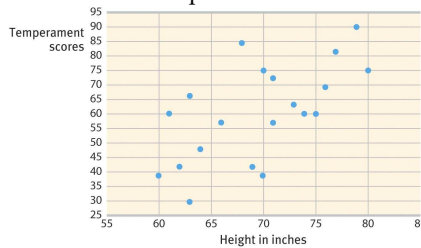
Correlation and Causation

Correlation does not mean causation!

Illusory Correlation

The perception of a relationship where no relationship actually exists. Parents conceive children after adoption.

	Conceive	Do not conceive
Adopt	Confirming evidence	Disconfirming evidence
Do not adopt	Disconfirming evidence	Confirming evidence

Order in Random Events

Given random data, we look for order and meaningful patterns.
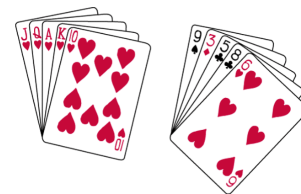
Your chances of being dealt either of these hands is precisely the same: 1 in 2,598,960.

Order in Random Events

Given large numbers of random outcomes, a few are likely to express order.

Angelo and Maria Gallina won two California lottery games on the same day.

Experimentation

Exploring Cause and Effect

Like other sciences, experimentation is the backbone of psychological research. Experiments isolate causes and their effects.

Exploring Cause & Effect

Many factors influence our behavior. Experiments (1) manipulate factors that interest us, while other factors are kept under (2) control.

Effects generated by manipulated factors isolate cause and effect relationships.

Evaluating Therapies

Double-blind Procedure

In evaluating drug therapies, patients and experimenter's assistants should remain unaware of which patients had the real treatment and which patients had the placebo treatment.

Evaluating Therapies

Random Assignment

Assigning participants to experimental (breast-fed) and control (formula-fed) conditions by random assignment minimizes pre-existing differences between the two groups.

Independent Variable

An independent variable is a factor manipulated by the experimenter. The effect of the independent variable is the focus of the study.

For example, when examining the effects of breast feeding upon intelligence, breast feeding is the independent variable.
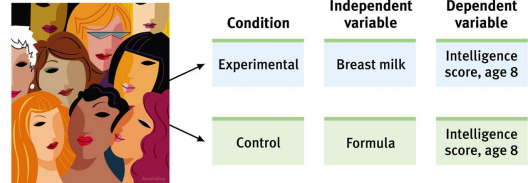
Dependent Variable

A dependent variable is a factor that may change in response to an independent variable. In psychology, it is usually a behavior or a mental process.

For example, in our study on the effect of breast feeding upon intelligence, intelligence is the dependent variable.

Experimentation

A summary of steps during experimentation.

Random assignment
(controlling for other variables such as parental intelligence and environment)

Condition	Independent variable	Dependent variable
Experimental	Breast milk	Intelligence score, age 8
Control	Formula	Intelligence score, age 8

Comparison

Below is a comparison of different research methods.

COMPARING RESEARCH METHODS

Research Method	Basic Purpose	How Conducted	What Is Manipulated	Weaknesses
Descriptive	To observe and record behavior	Do case studies, surveys, or naturalistic observations	Nothing	No control of variables; single cases may be misleading
Correlational	To detect naturally occurring relationships; to assess how well one variable predicts another	Compute statistical association, sometimes among survey responses	Nothing	Does not specify cause and effect
Experimental	To explore cause and effect	Manipulate one or more factors; use random assignment	The independent variable(s)	Sometimes not feasible; results may not generalize to other contexts; not ethical to manipulate certain variables

Statistical Reasoning

Statistical procedures analyze and interpret data allowing us to see what the unaided eye misses.

White 63%

Others 4%   Asian 7%   Hispanic 10%   Black 16%
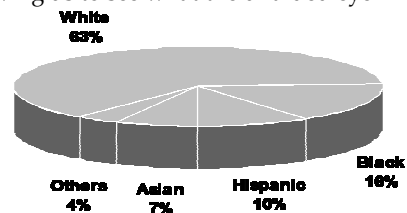
Composition of ethnicity in urban locales

Statistical Reasoning in Everyday Life

Doubt big, round, undocumented numbers as they can be misleading and before long, become public misinformation.

Apply simple statistical reasoning in everyday life to think smarter!

Describing Data

A meaningful description of data is important in research. Misrepresentation may lead to incorrect conclusions.
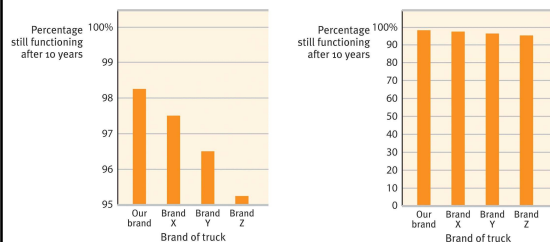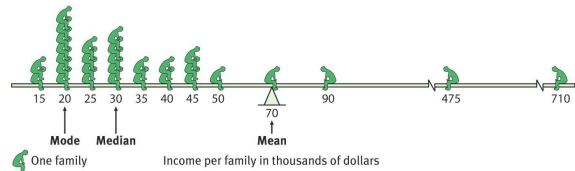
Measures of Central Tendency

Mode: The most frequently occurring score in a distribution.

Mean: The arithmetic average of scores in a distribution obtained by adding the scores and then dividing by the number of scores that were added together.

Median: The middle score in a rank-ordered distribution.


Measures of Central Tendency

A Skewed Distribution

15 20 25 30 35 40 45 50 70 90 475 710

Mode Median Mean

One family   Income per family in thousands of dollars

Measures of Variation

Range: The difference between the highest and lowest scores in a distribution.

Standard Deviation: A computed measure of how much scores vary around the mean.

Small Deviation

Large Deviation   Mean
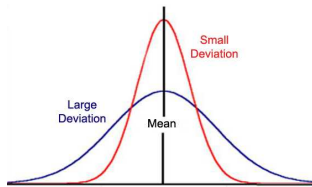
Standard Deviation

STANDARD DEVIATION IS MUCH MORE INFORMATIVE THAN MEAN ALONE

Note that the test scores in Class A and Class B have the same mean (80), but very different standard deviations, which tell us more about how the students in each class are really faring.

Test Scores in Class A			Test Scores in Class B		
Score	Deviation From the Mean	Squared Deviation	Score	Deviation From the Mean	Squared Deviation
72	−8	64	60	−20	400
74	−6	36	60	−20	400
77	−3	9	70	−10	100
79	−1	1	70	−10	100
82	+2	4	90	+10	100
84	+4	16	90	+10	100
85	+5	25	100	+20	400
87	+7	49	100	+20	400

Total = 640   Sum of (deviations)^2 = 204   Total = 640   Sum of (deviations)^2 = 2000

Mean = 640 ÷ 8 = 80   Mean = 640 ÷ 8 = 80

Standard deviation =   Standard deviation =

$$\sqrt{\frac{Sum\ of\ (deviations)^2}{Number\ of\ scores}} = \sqrt{\frac{204}{8}} = 5.0 \qquad \sqrt{\frac{Sum\ of\ (deviations)^2}{Number\ of\ scores}} = \sqrt{\frac{2000}{8}} = 15.8$$

Normal Curve

A symmetrical, bell-shaped curve that describes the distribution of many types of data (normal distribution). Most scores fall near the mean.

Illusion of Control

That chance events are subject to personal control is an *illusion of control* fed by:

1. **Illusory Correlation:** the perception of a relationship where no relationship actually exists.

2. **Regression Toward the Mean:** the tendency for extremes of unusual scores or events to regress toward the average.

Making Inferences

A statistical statement of how frequently an obtained result occurred by experimental manipulation or by chance.

Making Inferences

When is an Observed Difference Reliable?

1. Representative samples are better than biased samples.
2. Less-variable observations are more reliable than more variable ones.
3. More cases are better than fewer cases.

Making Inferences

When is a Difference Significant?

When sample averages are reliable and the difference between them is relatively large, we say the difference has statistical significance. It is probably not due to chance variation.

For psychologists this difference is measured through alpha level set at 5 percent.

Frequently Asked Questions About Psychology

Q1. Can laboratory experiments illuminate everyday life?

Ans: Artificial laboratory conditions are created to study behavior in simplistic terms. The goal is to find underlying principles that govern behavior.

FAQ

Q2. Does behavior depend on one's culture and gender?

Ans: Even when specific attitudes and behaviors vary across cultures, as they often do, the underlying processes are much the same. Biology determines our sex, and culture further bends the genders. However, in many ways woman and man are similarly human.

Ami Vitale/ Getty Images

FAQ

Q3. Why do psychologists study animals, and is it ethical to experiment on animals?

Ans: Studying animals gives us the understanding of many behaviors that may have common biology across animals and humans. From animal studies, we have gained insights to devastating and fatal diseases. All researchers who deal with animal research are required to follow ethical guidelines in caring for these animals.

D. Shapiro, © Wildlife Conservation Society

FAQ

Q4. Is it ethical to experiment on people?

Ans: Yes. Experiments that do not involve any kind of physical or psychological harm beyond normal levels encountered in daily life may be carried out.

FAQ

Q5. Is psychology free of value judgments?

Ans: No. Psychology emerges from people who subscribe to a set of values and judgments.
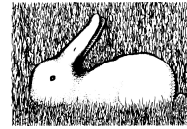
© Roger Shepard

FAQ

Q6. Is psychology potentially dangerous?

Ans: It can be, but is not when practiced responsibly. The purpose of psychology is to help humanity with problems such as war, hunger, prejudice, crime, family dysfunction, etc.