



Thinking Critically with Psychological Science

Chapter 1

PSY 12000-003
Prof. Williams

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Thinking Critically with Psychological Science

- What's wrong with relying too much on intuition?
 - We remember those occasions when our intuitions were correct
 - We forget or dismiss instances when our intuitions were incorrect
 - Thus, we overestimate the veracity of our intuitions.

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Post-hoc Explanations



- Hindsight bias "I knew it all along"
 - Why didn't friends and family know that Jared L. Loughner was going to be violent and hurt people?
 - It's a lot easier explaining why something happened after the fact than predicting what will happen before the fact ("Hindsight is 20/20")

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Application to You



- *This is why you don't look at the answers before you commit yourself to an answer on practice tests.*
- The _____ is a computed measure of how much the scores vary around the mean score.
 - A) correlation coefficient
 - B) standard deviation
 - C) median
 - D) range

Answer: B

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Overconfidence from Hindsight Bias

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

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Thinking Critically ...

- Can we find evidence of ESP
 - Clairvoyance: ability to gain information about an object, person, location or physical event through means other than the known human senses.
- How to answer this?
 - The Case Study
 - The Survey
 - Naturalistic Observation
 - Correlations
 - Experiments



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Thinking Critically ...

Case Studies

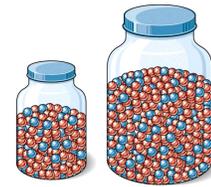
- I read an article where a man “saw” his wife being killed in a car accident, and it turns out at that very moment she was indeed killed in a car accident 200 miles away.
- Problem: Self-selection/remembering supporting instances

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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.

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Thinking Critically ...

Surveys

- Q: Have you ever experienced the ability to know something without relying on your five senses?
- Q: Have you ever “known” something was going to happen, and it did?
- Q: Do you believe in ESP?

Problems: Self-selection/beliefs aren’t necessarily accurate reflections of internal processes/question wording can alter answers

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Thinking Critically ...

Naturalistic Observation

- I saw a TV show where the guy could tell what others were thinking.



Problem: experimenter bias, trickery, self-selection

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Thinking Critically ...

Correlation

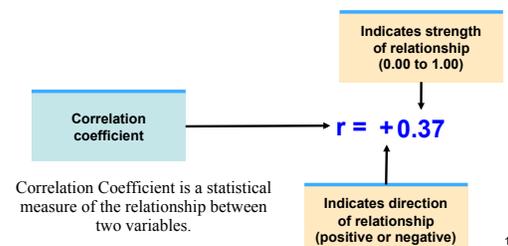
- A “clairvoyant” makes a prediction about the stock market daily. He predicts either “up” or “down” and this is correlated with whether the market actually ended “up” or “down” on each day.
- His predictions correlated $+0.6$.
- Therefore???



Problem: reverse causation or third variables accounting for effect: during a Bear Market, pessimism will be more accurate.

Correlation

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



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Psychological Science¹

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

¹One of the premier journals in our field is also called **Psychological Science**. It's Editor is Robert Kail, Professor of Psychological Sciences, Purdue University!

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The Scientific Attitude

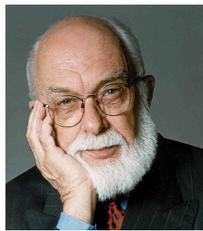
The scientific attitude is composed of **curiosity** (passion for exploration), **skepticism** (doubting and questioning) and **humility** (ability to accept responsibility when wrong).

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Critical Thinking

Critical thinking does not accept arguments and conclusions blindly.

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



The Amazing Randi

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The Experiment

- <http://www.youtube.com/watch?v=J2tfWBZ1A-M>



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Scientific Method

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

NEWSFLASH:

Study on ESP published in one of psychology's top journals:

<http://abcnews.go.com/Technology/extrasensory-perception-scientific-journal-esp-paper-published-cornell/story?id=12556754>

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Theory

A **Theory** is an explanation that integrates principles and organizes and predicts behavior or events. From a theory, many hypotheses can be derived and tested.

Grand Theories: tries to explain all (or nearly all) behavior. Example: Freud's theory

Mini Theories: tries to explain behavior within a specific domain. Example: Elaboration Likelihood Model tries to explain persuasion effects.

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Hypothesis

A **Hypothesis** is a testable prediction, *often prompted by (derived from) a theory*, or inferred from observing behaviors, to enable us to accept, reject or revise the theory.

Deductive: Derived from Theory (top down)

vs

Inductive: Derived from Observation (bottom up)

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Thinking Critically ...

Experimentation

- Exploring Cause and Effect
- Experimental control: Controlling other variables while manipulating the ones of interest
- Control or comparison groups
- Random assignment
- Independent and Dependent Variables

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Experimentation

Exploring Cause and Effect

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

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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.

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Experimentation

- Experimental control: Controlling other variables while manipulating the ones of interest
 - What do we want to manipulate?
 - What do we want to hold constant?
- Control or comparison groups
 - What is (or are) the best control group(s)?
 - There can be more than one comparison/control group.

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Random Assignment



Assigning participants to experimental (cell phone) and control (??) conditions by random assignment minimizes pre-existing differences between the two groups.

Random Selection

Choosing participants so that they are a random sample from the population of interest (so that they are representative and not an unusual sample).



*For experiments, random assignment is **essential**; random selection is less important*

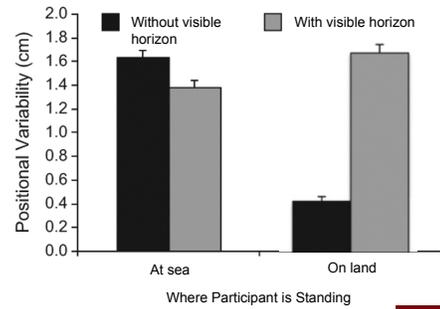
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Example

- Mayo, A. M., Wade, M. G., & Stoffregen, T. A. (2010). Postural effects of the horizon on land and at sea. *Psychological Science*, 22, 118-124.
- Motion of a ship at sea creates challenges for control of the body. Anecdotal reports suggest that the body can be stabilized by standing on the open deck and looking at the horizon. This advice contrasts with land-based findings that looking at the horizon leads to increased body sway. We measured standing body sway in experienced maritime crew members on land and at sea. On land, body sway was greater when subjects looked at the horizon than when they did not—the classical effect. At sea, body sway was greater in a closed cabin than on the open deck. On the open deck, body sway when looking at the horizon was reduced relative to sway when looking at middistance targets on the ship. The results are consistent with centuries of anecdotal advice given to sea travelers and raise new questions about the referents that are used for the control of standing posture.

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Fig. 6. Body sway at sea without (Experiment 2) and with (Experiment 3) the visible horizon.



Mayo A M et al. *Psychological Science* 2010.22:118-124

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Psychological
SCIENCE

Independent Variable

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

Participants are randomly assigned to one level of the independent variable.

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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 (but, could also be physiological, facial emotion, etc.).

This is the **outcome** measure. The experimenter believes the outcome will be different depending on which level of the IV the participant experienced.

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Example 1: Embodied Perception

- Certain fundamental factors, temperature being one, influence us in many ways.
- Starbucks Coffee study.
- Experimenter asks participant to hold coffee before entering lab



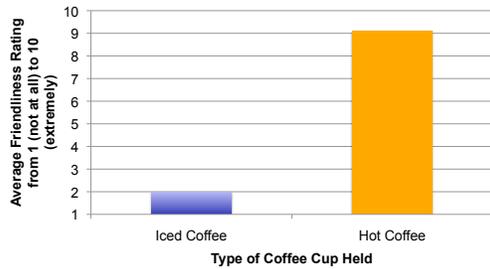
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Example 1

- Being primed with hot or cold will cause individuals to perceive others as hot or cold.
- IV?
- DV?

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Example 1: Graph



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Example 1 with a twist

- Suppose we predicted that this general effect in the first example was mostly true of “highly sensitive” individuals, but that individuals low in sensitivity would not be affected.
- What then?
- What do we call this new variable... sensitivity? Is it an IV? A DV? Or something else?

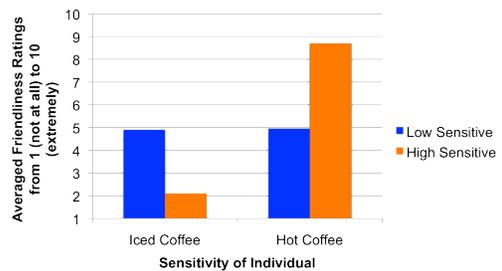
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Predictor Variables

- Variables that we believe will affect the outcome (as measured by the Dependent Variable)
- Are NOT manipulated
- Are measured as some characteristic of the participant that is part of who they are
- Called: PREDICTOR VARIABLES

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Example 1 with a twist: Graph



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Example 2: Fear & Affiliation

Schachter's Fear and Affiliation Study

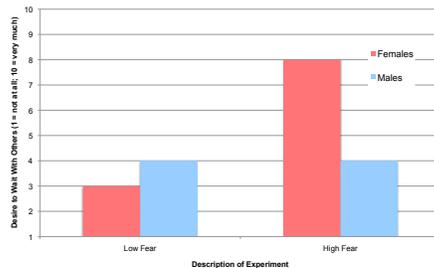
retcom 26 videos



- <http://www.youtube.com/watch?v=G7bpwbnged4>

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Example Graph from Fear & Affiliation Study



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Example 3

Li, X., Wei, L., & Soman, D. (2010).
Sealing the emotions genie: The effects of
physical enclosure on psychological
closure. *Psychological Science*, 21,
1047-1050.



Basic Idea

- Does enclosing an emotionally laden stimulus minimize the emotion?
 - Or does it backfire, like other methods of suppression?
- Place a written recollection of a regretted past decision or unsatisfied strong desire in an envelope.
- Hypothesis: This will reduce the negative emotion
 - Compared to what? (control group, or comparison group)

Experiment 1a



Methods: Experiment 1a

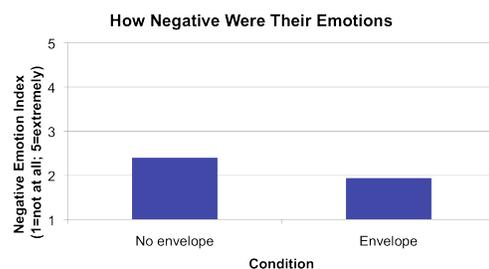
- 80 students (47 female; ages 18-24)
- Recall and write down a recent decision that they regretted
- Assigned randomly to one of two conditions:
 - Place their written recollection into an envelope before handing it to experimenter, OR
 - Return it directly to the experimenter
- Then they were all asked to answer the following question:
 - Averaged Index of: Regretful, guilty, sad, worried, ashamed (on 1-5 point scales)

Questions:

- What is or are the Independent Variable(s)?
- What is or are the Dependent Variable(s)?
- Are there any Predictor Variables?

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Results: Experiment 1a



Methods: Experiment 1b

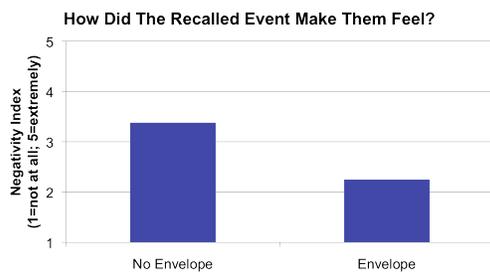
- 40 female college students
- Recall and write down a strong personal desire not fulfilled
- Assigned randomly to one of two conditions:
 - Place their written recollection into an envelope before handing it to experimenter, OR
 - Return it directly to the experimenter
- Then they were all asked to answer the following question:
 - How did the recalled event make them feel? (Index of anxious, disappointed, sad, unsatisfied) (on 1-5 point scales)

Questions:

- What is or are the Independent Variable(s)?
- What is or are the Dependent Variable(s)?
- Are there any Predictor Variables?

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Results: Experiment 1b



Methods: Experiment 2

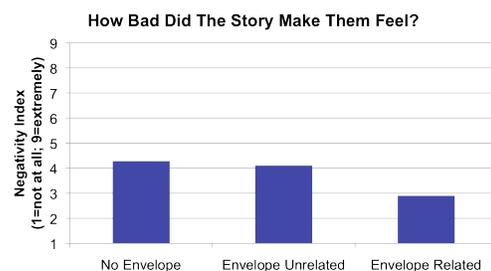
- 80 college students (55 females)
- Read a news story about a baby's tragic death
- Filler task
- A third randomly assigned to hand back questions directly (no envelope)
- A third inserted results of filler task into envelope (unrelated)
- A third inserted response to story in envelope (envelope)
- Afterwards, they were asked how did the story make them feel? 1-9; higher scores indicate they felt worse).

Questions:

- What is or are the Independent Variable(s)?
- What is or are the Dependent Variable(s)?
- Are there any Predictor Variables?

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Results: Experiment 2



Methods: Experiment 3

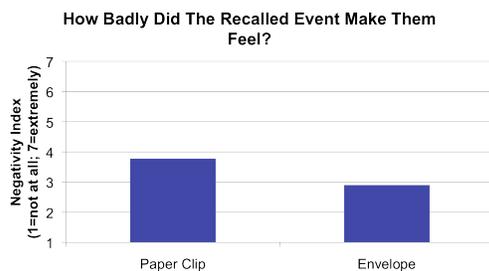
- 47 college students (20 females)
- Participants were asked to write down an event that they regretted.
- Then they were asked, "How clear and detailed was your memory?"
- Half were randomly assigned to paper clip responses together before handing back to Experimenter (no envelope), OR to
- Place written recollection and memory clarity answers in envelope (envelope)
- They were then asked, "How did you feel about the event you just recalled?" (on a scale of 1-7; higher scores indicate they felt worse).

Questions:

- What is or are the Independent Variable(s)?
- What is or are the Dependent Variable(s)?
- Are there any Predictor Variables?

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Results: Experiment 3



Synchrony and Destructive Obedience

By Scott Wiltermuth
University of Southern California

Background

- Anecdotally, many instances of behavioral synchrony and obedience come to mind
 - Goose stepping Nazis, North Koreans, etc.
- Is this behavior “just to impress” (Haidt et al, 2006), or does engaging in behavioral synchrony increase the likelihood to be obedient?

Rationale/Lit Review

- Synchrony can increase cohesiveness (McNeill, 1995; Wiltermuth & Heath, 2009) and positive affect (“collective *effervescence*” (Haidt et al., 2006), *communitas* (Durkheim, 1965))
- Synchrony weakens boundaries between self and group (Ehrenreich, 2006; Hannah, 1977)
- Synchrony → feelings of connectedness; people more likely to comply with requests from those to whom they feel connected.
- Can it promote anti-social acts, too?

Hypothesis

- Participants who engage in synchronous behavior (as opposed to those who do not) will be more likely to comply/obey.

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Study 1

- 33 university students (40% female)
- Arrived individually; paired with female confederate
- Told they would be performing parts of "The Hokey Pokey"
 - E would read part of each lyric and they would complete the lyric while performing the specified action
 - Synchronous: ps read stanzas at same time
 - Asynchronous: C started in middle of song; P started at beginning



Study 1 Task

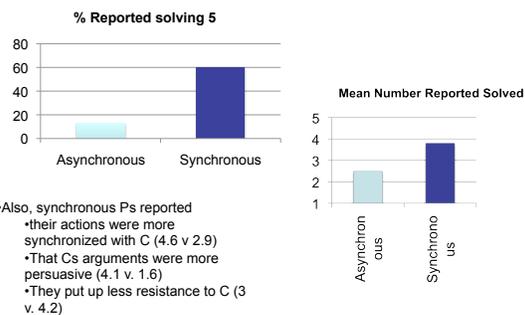
- Anagram Task
 - Told, as a separate experiment, they would each have 7 minutes to complete anagram task.
 - They would earn \$1 per consecutively solved anagram (if there was a gap, nothing solved after the gap would be rewarded)
 - As a dyad, they would be rewarded for the least successful of the two.
 - The third anagram was nearly impossible to solve (taguan).
 - When E returned, he threw the sheets into trash; asked dyad to agree upon what they were to be rewarded.
 - C said the anagrams were too hard and urged P to lie and say they solved five.
- E observed the number of anagrams P reported solving

Questions:

- What is or are the Independent Variable(s)?
- What is or are the Dependent Variable(s)?
- Are there any Predictor Variables?

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Study 1 Results



Study 2: Authority and destructive obedience

- 43 participants (61% female)
- 1st walked across campus with E
 - Told to synchronize their walking with E, or not (they all walked behind E; E wore headphones)
- Then, in an "unrelated experiment," E asked to kill a number of sow bugs and grind them up in a machine.
- Experimenter observed and recorded:
 - # sow bugs "exterminated"
 - % willing to press the extermination button



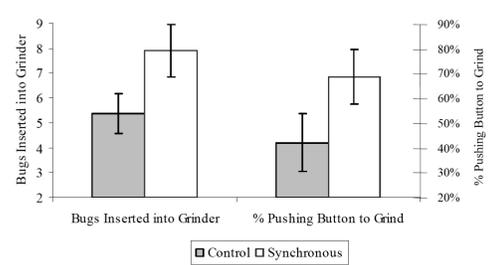
Martens et al 2007

Questions:

- What is or are the Independent Variable(s)?
- What is or are the Dependent Variable(s)?
- Are there any Predictor Variables?

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Results



Note: Men put more bugs into grinder, but gender did not interact with synchrony

Discussion & Relevance

- Participants more willing to lie (Study 1) and to kill (Study 2) following physical synchrony with another person.
- “Cultural practices involving synchrony (e.g., marching, dancing, chanting) may enable leaders to bind their followers to them, making them more likely to engage in destructive obedience.”

Critique

- Obedience or compliance?
- Synchrony or entrainment
- Synchrony or depleted cognitive resources?

- “I added some conditions and subjects to existing conditions. The first new condition has people consciously coordinating their walk with the experimenter but taking a step with their left when the experimenter takes a step with his right. Obedience in this condition was the same as in the control condition and less than in the synchronous condition. I added this condition, in part, to eliminate the possibility that either task difficulty or previous following of instructions was driving the effect.
- The second new condition has people walking in-step with a different experimenter. Obedience in this condition was a bit less than in the control condition, but non-significantly so. I added this condition to provide further support for the idea that synchrony has its effect by strengthening cohesion with the person issuing commands.” (Personal communication, Feb 17, 2010).

Thinking Critically ...

Statistical Reasoning

- Describing Data
- Making Inferences

FAQs About Psychology

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Impression of Psychology

With hopes of satisfying curiosity, many people listen to talk-radio counselors and psychics to learn about others and themselves.



Dr. Crane (radio-shrink)



Psychic (Ball gazing)

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The Need for Psychological Science

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.

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Limits of Intuition

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



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Errors of Common Sense

Try this !

Fold a piece of paper (0.1 mm thick) 100 times. How thick will it be?

800,000,000,000,000 times the distance between the sun and the earth.

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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.

This is why you don't look at the answers before you commit yourself to an answer on practice tests.

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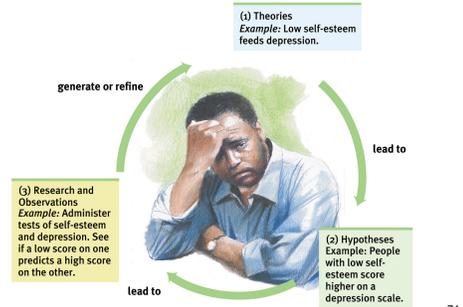
Research Observations

Research would require us to administer tests of self-esteem and depression. Individuals given failure vs success feedback would then be tested on a self-esteem test. Presumably, self-esteem would be lower for the failure group. Then, we would give participants a depression test. Presumably, those with failure feedback (through lowered self-esteem) would have higher depression scores.

This would *support* our hypothesis.

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Research Process



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Description

Case Study

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



Is language uniquely human?

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Case Study

Clinical Study

A clinical study is a form of case study in which the therapist investigates the problems associated with a client.



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Survey

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



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Survey

False Consensus Effect

A tendency to overestimate the extent to which others share our beliefs and behaviors.

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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.



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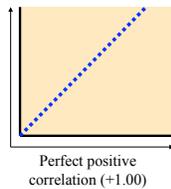
Descriptive Methods

Summary

Case studies, surveys, and naturalistic observation describe behaviors.

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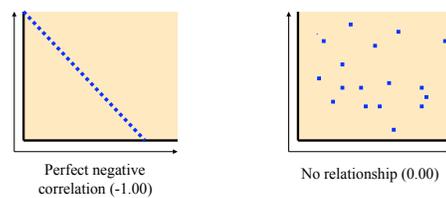
Scatterplots



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.

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Scatterplots



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

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Data

Data showing height and temperament in people.

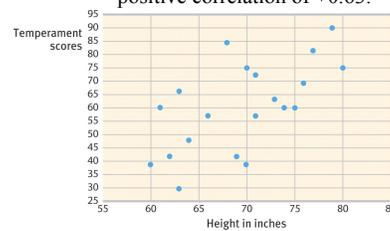
HEIGHT AND TEMPERAMENT OF 20 MEN		
Subject	Height in Inches	Temperament
1	80	75
2	63	66
3	61	60
4	79	90
5	74	60
6	69	42
7	62	42
8	75	60
9	77	81
10	60	39

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

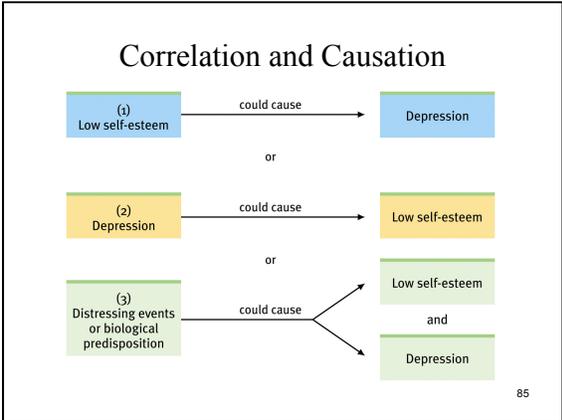
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Scatterplot

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



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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	 <small>Michael Newman for iStockphoto</small>
Do not adopt	Disconfirming evidence	Confirming evidence	

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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.

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Order in Random Events

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



Jerry Heller/San Francisco Chronicle

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

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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.

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Comparison

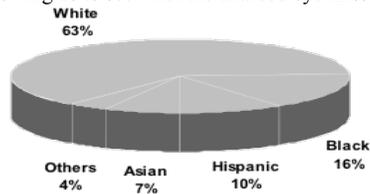
Below is a comparison of different research methods.

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

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Statistical Reasoning

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

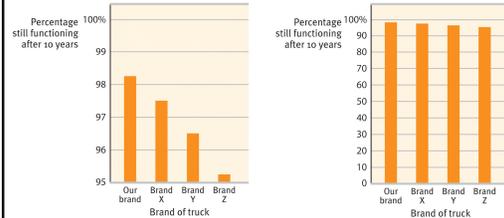


Composition of ethnicity in urban locales

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Describing Data

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



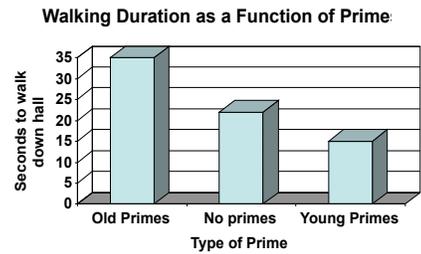
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Example 1

- Individuals primed with “old people concepts” are more likely to walk slower than those who are not primed with “old people concepts.”
- *Independent variable*
 - Operationally define “old people concepts”
- *Dependent variable*
 - Operationally define “walking speed.”

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Example 1: Graph



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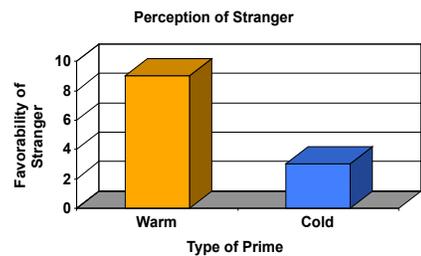
Example 2

- Temperature (among a few other concepts like size and distance) is a fundamental facet of human understanding and perception. It permeates everything.
- People primed with warm will construe a more favorable person perception of a stranger than if they are primed with cold
- *Independent variable*
 - Operationally define “warm” and “cold”
- *Dependent variable*
 - Operationally define “person perception.”



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Example 2: Graph



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Measures of Central Tendency

Mode: The most frequently occurring score in a distribution.

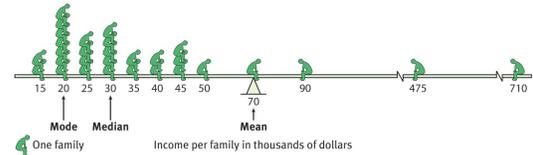
Mean: The arithmetic average of scores in a distribution obtained by adding the scores and then dividing by the number of scores that were added together.

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

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Measures of Central Tendency

A Skewed Distribution

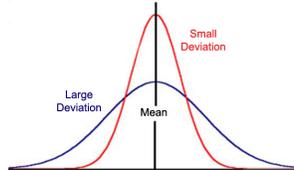


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Measures of Variation

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.



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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 doing.

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

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Example 3

- Students get better grades if they sit near the front of the classroom
- Independent variable
- Predictor variable
- Dependent variable

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Example 4

- Hypothesis: People are more likely to wash their hands in a public bathroom if other people are in the bathroom.
- Why might this be the case (rationale)?
- How would you test this? (method)

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Making Inferences

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

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Making Inferences

When is an Observed Difference Reliable?

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

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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.

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

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FAQ

Q1. Can laboratory experiments illuminate everyday life?

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

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FAQ

Q2. Does behavior depend on one's culture?

Answer: Even when specific attitudes and behaviors vary across cultures, as they often do, the underlying processes are much the same.



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FAQ

Q3. Does behavior vary with gender?

Answer: Yes. Biology determines our sex, and culture further bends the genders. However, in many ways females and males are similarly human.

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FAQ

Q4. Why do psychologists study animals?

Answer: Studying animals gives us the understanding of many behaviors that may have common biology across animals and humans.

And, there are more animals in the world than people, and their behavior is interesting in and of itself.



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FAQ

Q5. Is it ethical to experiment on animals?

Answer: To gain insights to devastating and fatal diseases. All researchers who deal with animal research are required to follow ethical guidelines in caring for these animals.

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FAQ

Q6. Is it ethical to experiment on people?

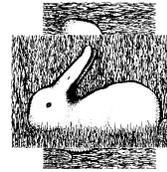
Answer: Experiments that do not involve any kind of physical or psychological harm beyond normal levels encountered in daily life may be carried out.

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FAQ

Q7. Is psychology free of value judgments?

Answer: No. Psychology emerges from people who subscribe to a set of values and judgments.



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FAQ

Q8. Is psychology potentially dangerous?

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

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