Unit II: Critical Thinking

The "Amazing (James) Randi": Secrets of the Psychics

http://www.nytimes.com/2014/11/09/magazine/the-unbelievable-skepticism-of-the-amazing-randi.html?_r=0

https://www.youtube.com/watch?v=2MFAvH8m8aI

Did We Know It All Along? Hindsight Bias

Hindsight Bias

“I knew it all along”

True or False?

Psychological research discussed in modules to come will either confirm or refute each of these statements (adapted, in part, from Furnham et al., 2003). Can you predict which of these popular ideas have been confirmed and which refuted?

1. If you want to teach a habit that persists, reward the desired behavior every time, not just intermittently (see Module 27).
2. Patients whose brains are surgically split down the middle survive and function much as they did before the surgery (see Module 13).
3. Traumatic experiences, such as sexual abuse or surviving the Holocaust, are typically "repressed" from memory (see Module 33).
4. Most abused children do *not* become abusive adults (see Module 50).
5. Most infants recognize their own reflection in a mirror by the end of their first year (see Module 47).
6. Adopted siblings usually do not develop similar personalities, even though they are reared by the same parents (see Module 14).
7. Fears of harmless objects, such as flowers, are just as easy to acquire as fears of potentially dangerous objects, such as snakes (see Module 15).
8. Lie detection tests often lie (see Module 41).
9. The brain remains active during sleep (see Modules 22–23).

True or False? Answers: 1. F, 2. T, 3. F, 4. T, 5. F, 6. T, 7. F, 8. T, 9. T

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Overconfidence

- Overconfidence
  - We tend to think we know more than we do
  - Richard Goranson Study
    - WREAT ---------- WATER
    - ETRYN---------- ENTRY
    - GRABE---------- BARGE

Perceiving Order in Random Events

- Comes from our need to make sense out of the world
  - Coin flip
  - Poker hand

The Scientific Attitude: Curious, Skeptical and Humble

Three main components

- Curious eagerness
- Skeptically scrutinize competing ideas
- Open-minded humility before nature

Hindsight bias, overconfidence and our tendency to perceive patters in random events often lead us to overestimate our intuition.

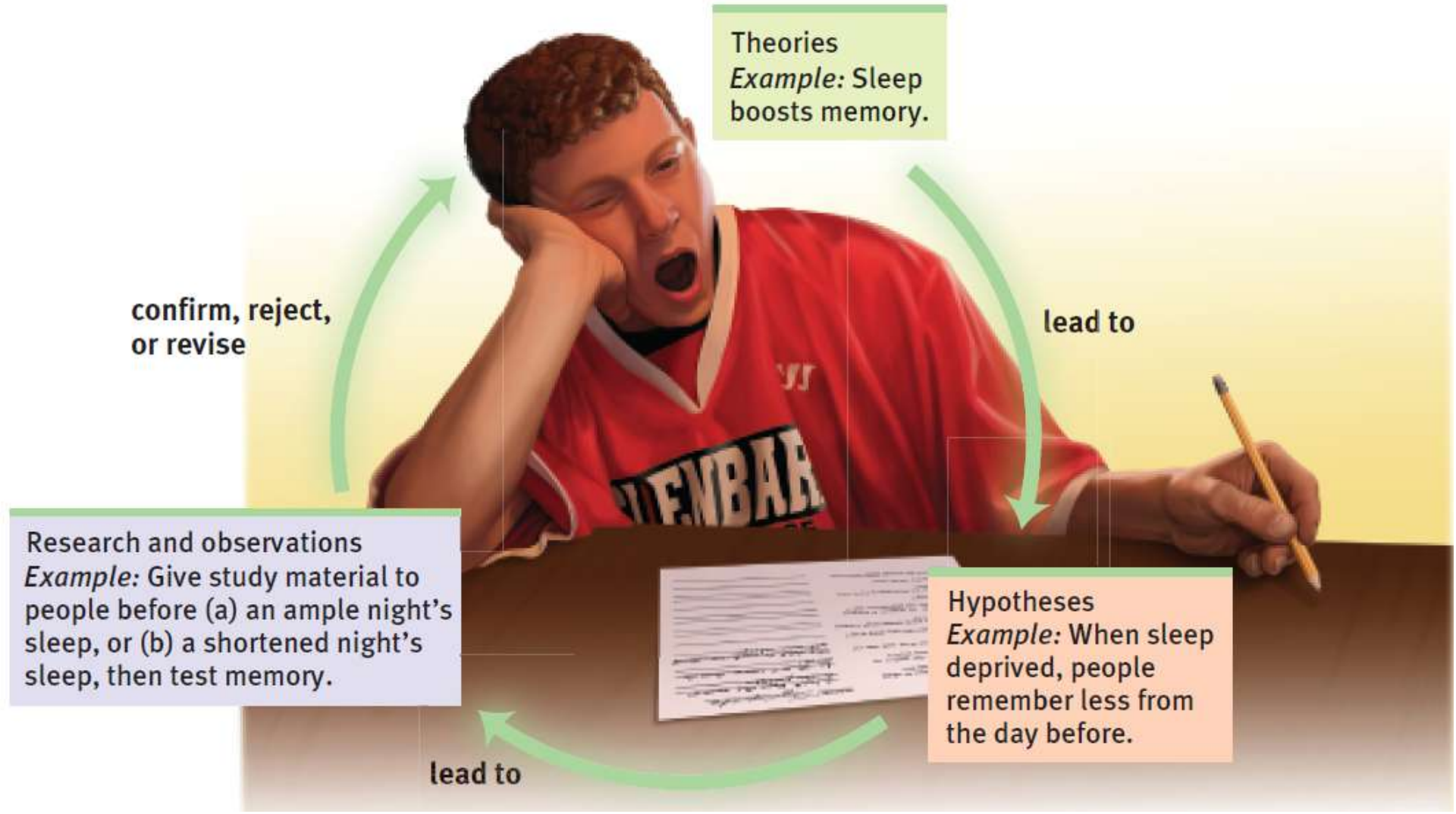
Critical Thinking

- Critical Thinking
  - “Smart thinking”
  - Elements
    - Examines assumptions
    - Assesses the source
    - Discerns hidden values
    - Confirms evidence
    - Assesses conclusions

The Scientific Method

- Theory
  - “mere hunch”
- Hypothesis
  - Can be confirmed or refuted
- Operational Definition
- Replication (repeat)

The Scientific Method



The Scientific Method

A good theory is useful if it:

- Effectively organizes a range of self-reports and observations
- Leads to clear hypotheses (predictions) that anyone can use to check the theory
- Often stimulates research that leads to a revised theory which better predicts what we know

Description

The Case Study

Case Study

- Hope to reveal universal truths
- Problems with atypical individuals
- Cannot discern general truths

Clever Hans
https://www.youtube.com/watch?v=_Nza20_I5qQ

Description

Naturalistic Observation

- Naturalistic Observation
  - Describes behavior
  - Does not explain behavior
- Participant Observation
  - Describes behavior
  - Does not explain behavior

Martin Harvey/Getty Images

Description

The Survey

- Survey
  - Looks at many cases at once
- Word effects
- Random sampling
  - Representative sample
  - Sampling bias

Description

The Survey

Sampling

Population

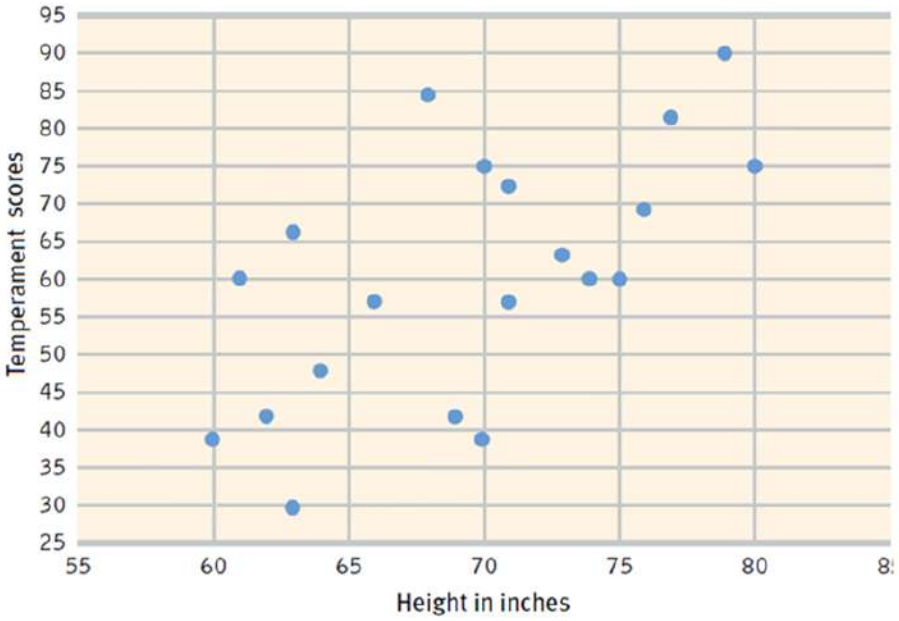
Random Sample


James Burnett/Miami Herald/MCTvia Getty Images

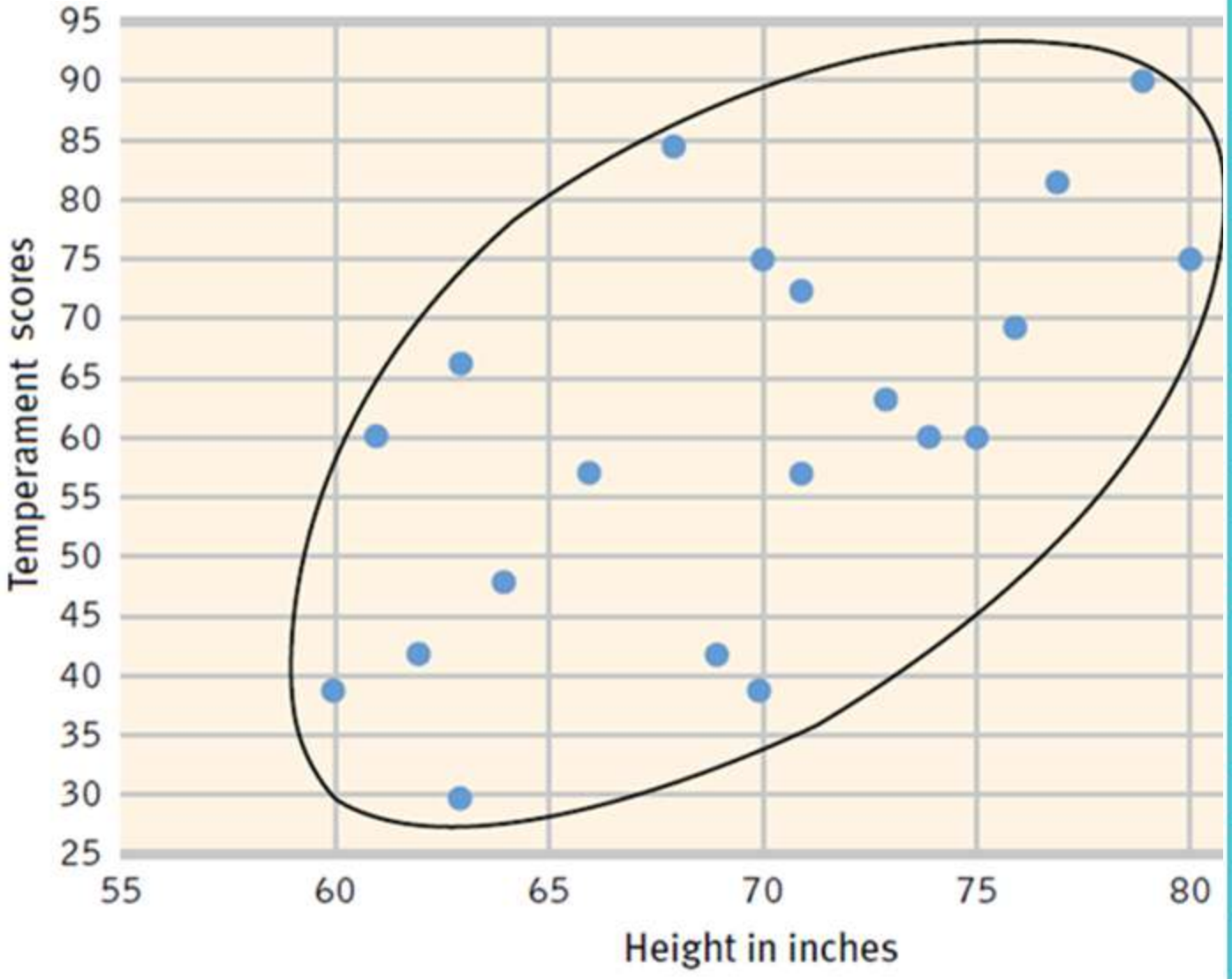
Correlation

Correlation (correlation coefficient)

- How well does A predict B
- Positive versus negative correlation
- Strength of the correlation
  - -1.0 to +1.0
- Scatterplot



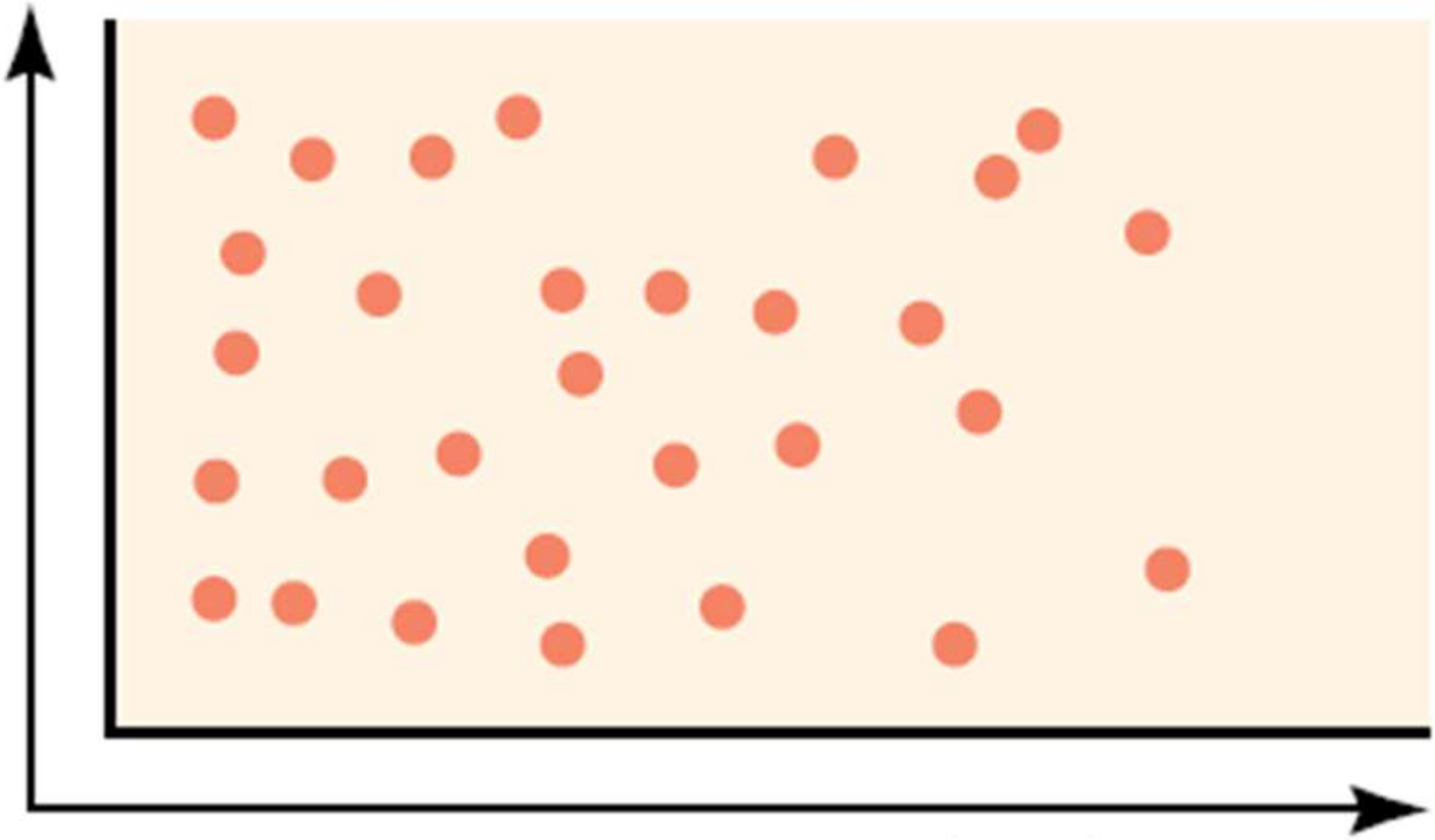
Correlation



Height and Temperamental Reactivity of 20 Men

Person	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
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

Correlation



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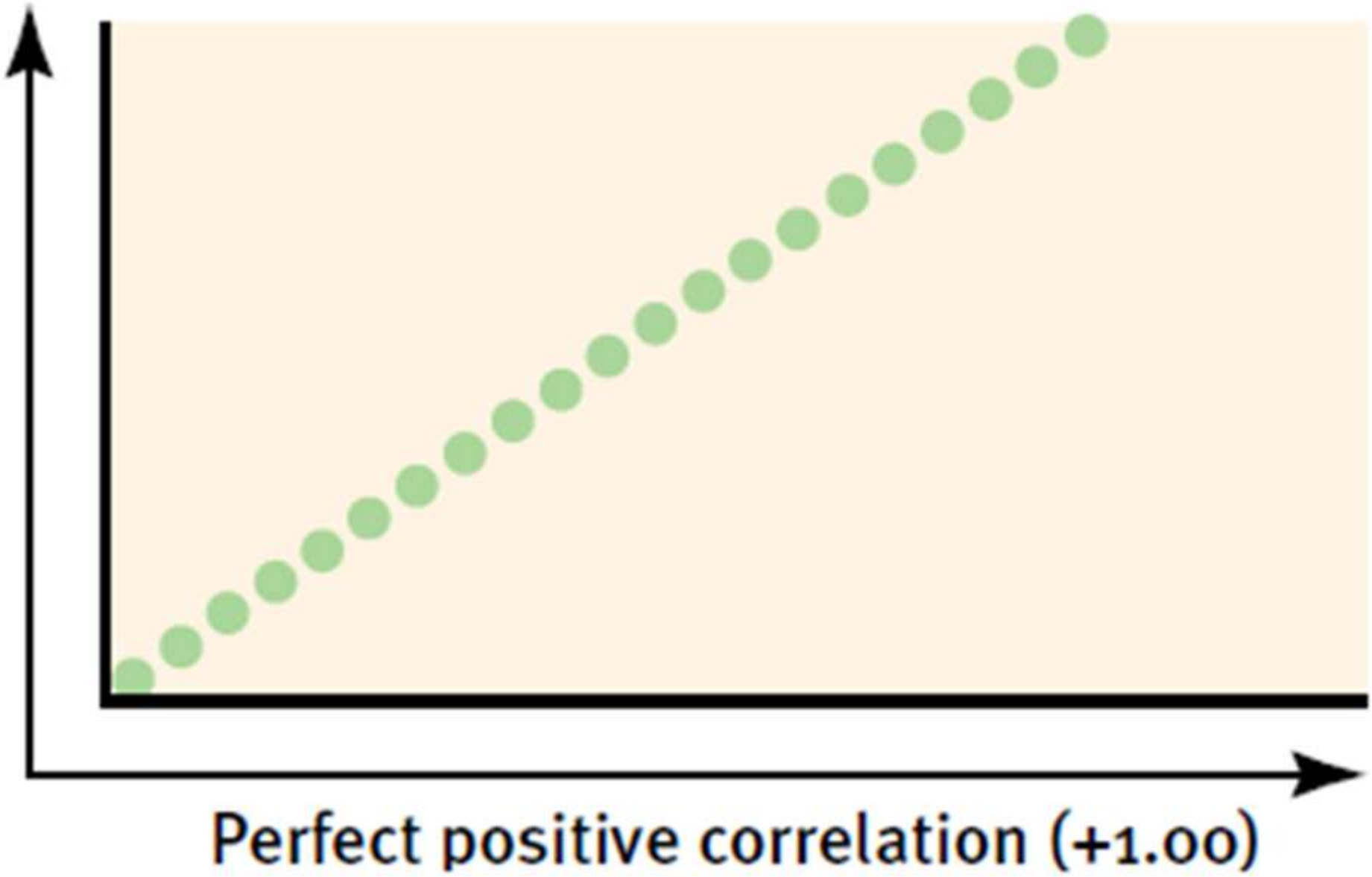
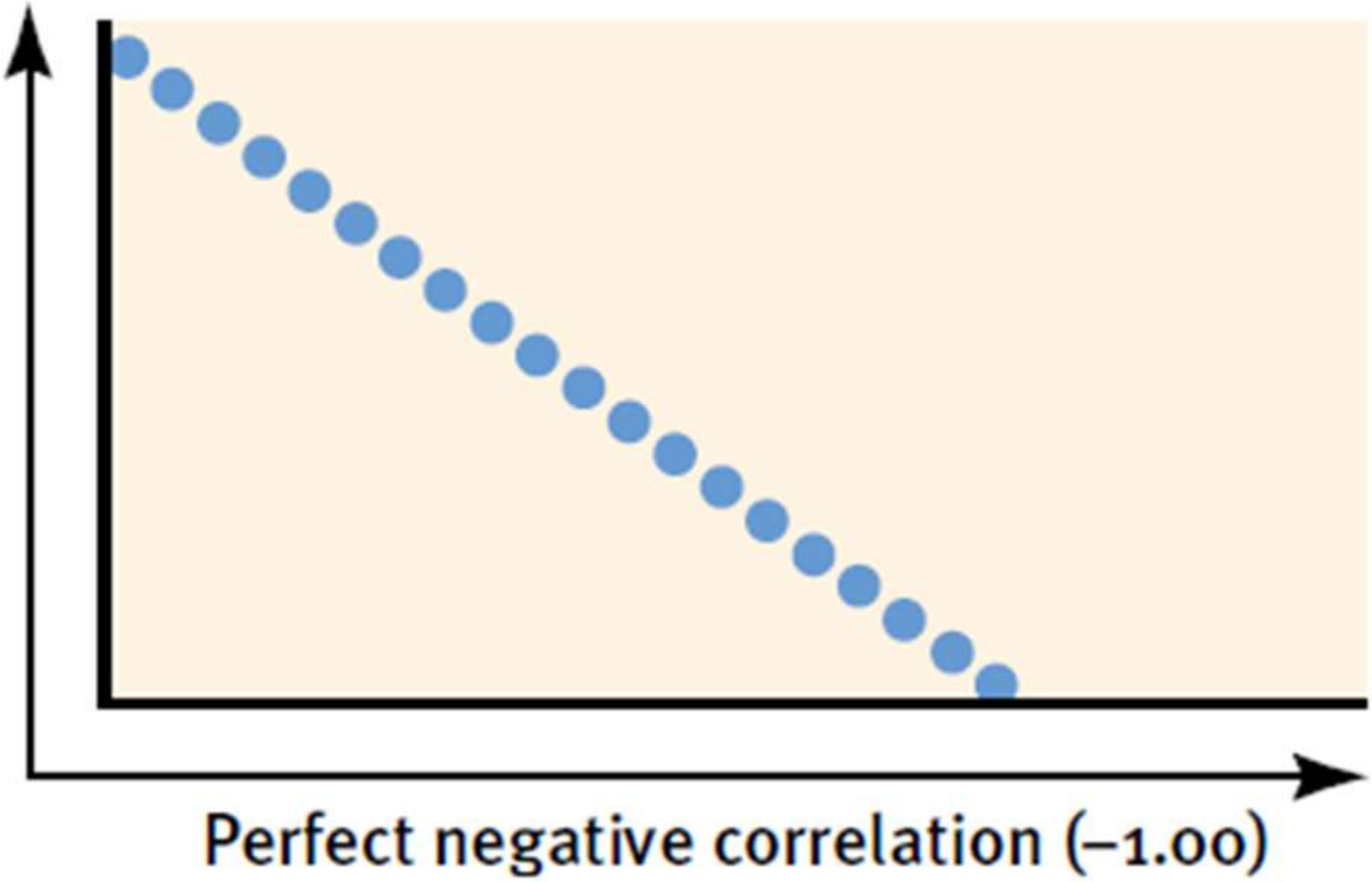


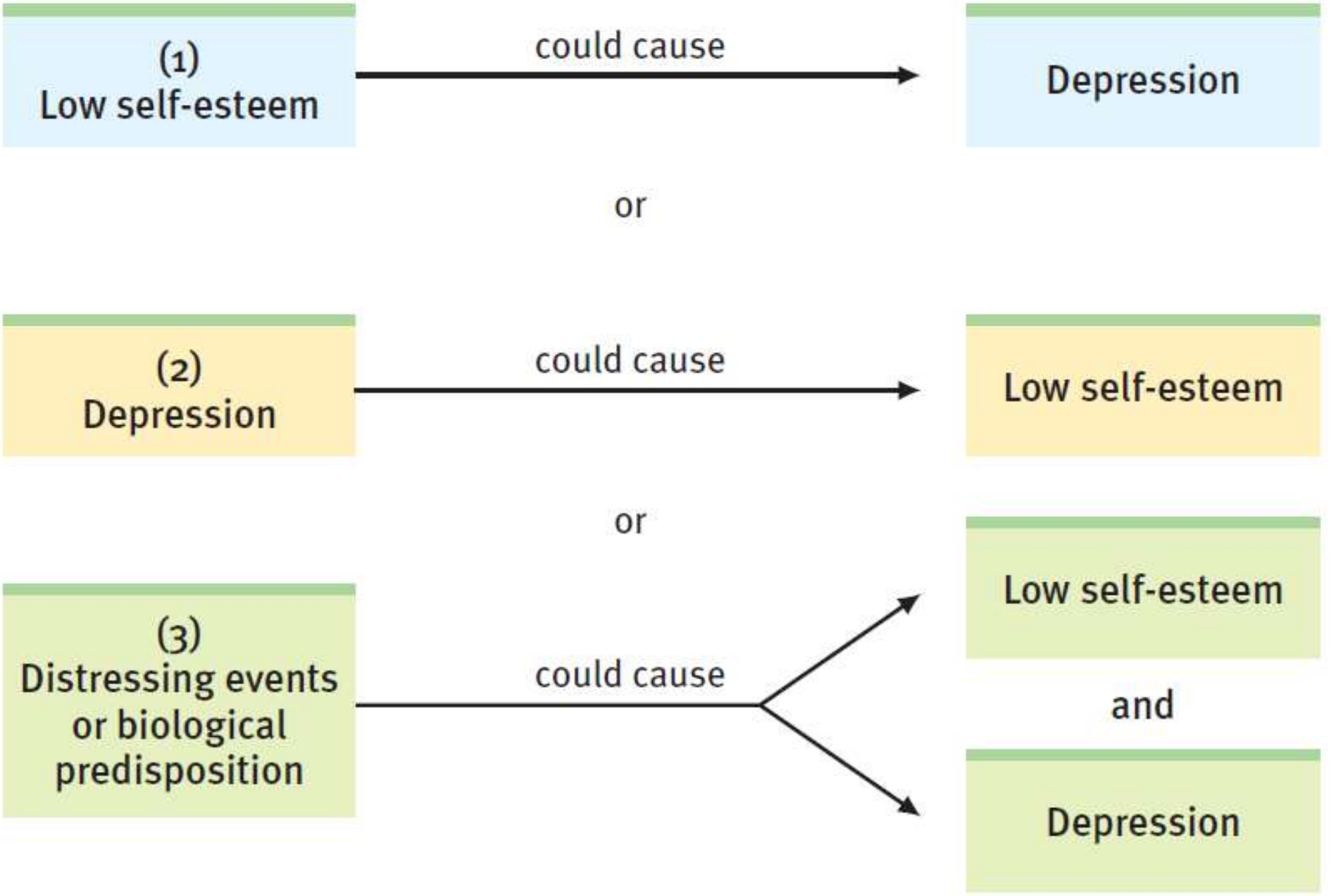
Correlation



Correlation and Causation

Correlation helps predict

Does not imply cause and effect


(1)
Low self-esteem
could cause
Depression
or
(2)
Depression
could cause
Low self-esteem
or
(3)
Distressing events or biological predisposition
could cause
Low self-esteem
and
Depression

Correlation

Illusory Correlations

Illusory Correlation

Perceived non-existent correlation

A random coincidence

	Conceive	Do not conceive
Adopt	confirming evidence	disconfirming evidence
Do not adopt	disconfirming evidence	confirming evidence

Michael Newman Jr./PhotoEdit

Experimentation

- Experiment
  - Can isolate cause and effect
  - Control of factors
    - Manipulation the factor interest
    - Hold constant (“controlling”) factors

Lane Oatey/Getty Images

Experimentation

- Groups
  - Experimental Group
    - Receives the treatment (independent variable)
  - Control Group
    - Does not receive the treatment

Lane Oatey/Getty Images

Experimentation

Randomly assigned

- Eliminates alternative explanations
- Equalizes the two groups
- Reduces the influence of other (confounding variables)
- Different from random sample

Lane Oatey/Getty Images

Experimentation

- Blind (uninformed)
  - Single-Blind Procedure
  - Double-Blind Procedure
- Placebo Effect

"If I don't think it's going to work, will it still work?"

Experimentation

Independent and Dependent Variables

- Independent Variable
  - Confounding variable
    - Effect of random assignment on confounding variables
- Dependent Variable
  - What is being measured
- Validity

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

© Radius Images/Alamy

Group	Independent variable	Dependent variable
Experimental	Promoted breast feeding	Intelligence score, age 6
Control	Did not promote breast feeding	Intelligence score, age 6

Comparing Research Methods

Comparing Research Methods

Research Method	Basic Purpose	How Conducted	What Is Manipulated	Strengths	Weaknesses
Descriptive	To observe and record behavior	Do case studies, naturalistic observations, or surveys	Nothing	Case studies require only one participant; naturalistic observations may be done when it is not ethical to manipulate variables; surveys may be done quickly and inexpensively (compared with experiments)	Uncontrolled variables mean cause and effect cannot be determined; single cases may be misleading
Correlational	To detect naturally occurring relationships; to assess how well one variable predicts another	Collect data on two or more variables; no manipulation	Nothing	Works with large groups of data, and may be used in situations where an experiment would not be ethical or possible	Does not specify cause and effect
Experimental	To explore cause and effect	Manipulate one or more variables; use random assignment	The independent variable(s)	Specifies cause and effect, and variables are controlled	Sometimes not feasible; results may not generalize to other contexts; not ethical to manipulate certain variables

The Need for Statistics

Understanding basic statistics is beneficial for everyone

Patrick Hardin/cartoonstock

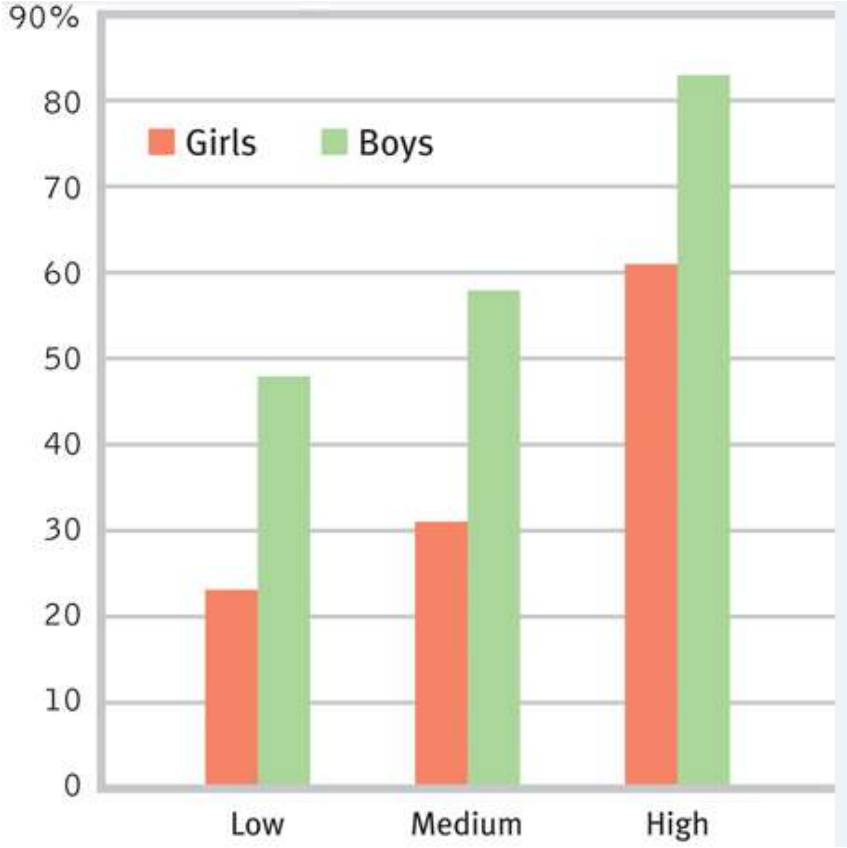
"Figures can be misleading—so I've written a song which I think expresses the real story of the firm's performance this quarter."

Descriptive Statistics

Descriptive Statistics

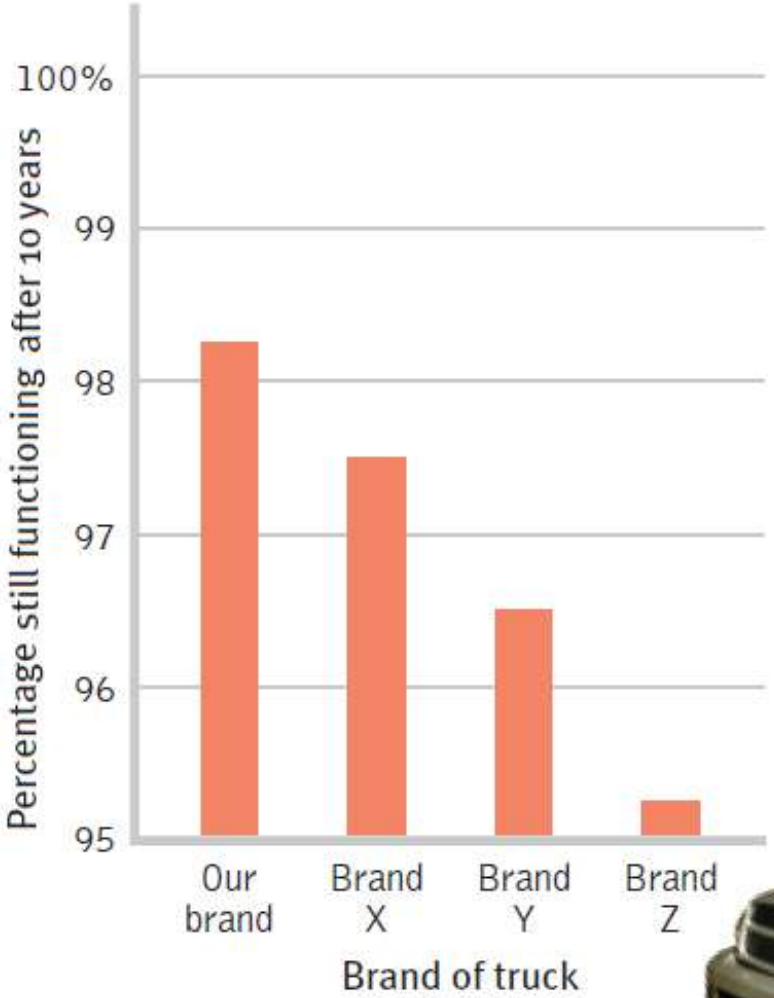
Histogram (bar graph)

Scale labels



Descriptive Statistics

Histogram



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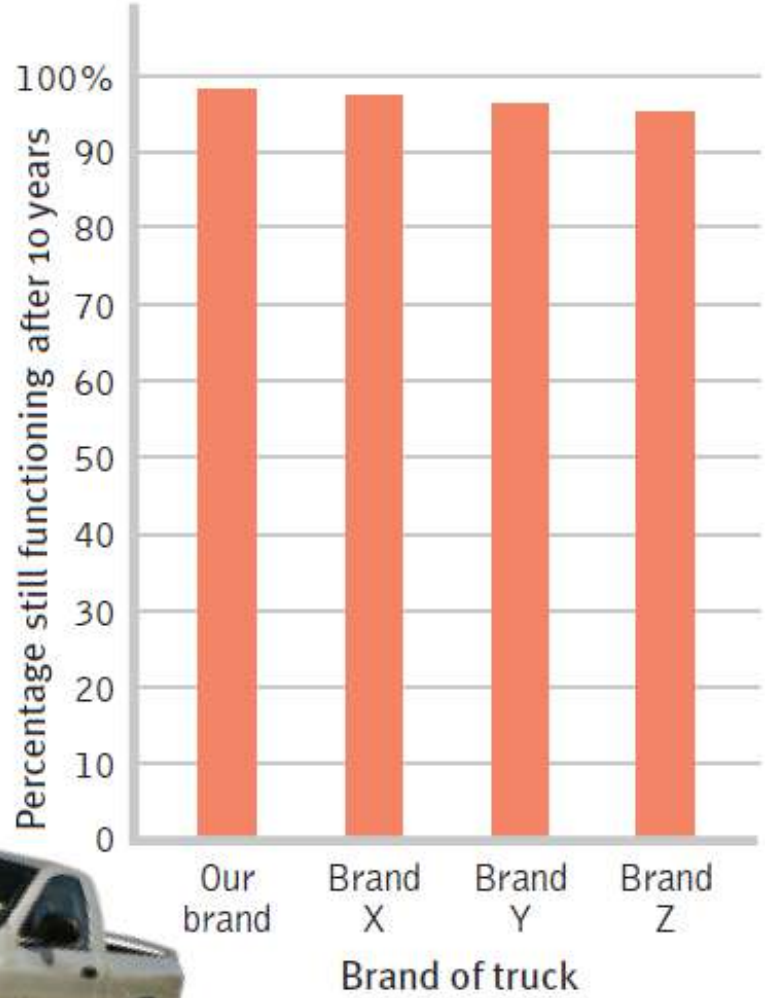
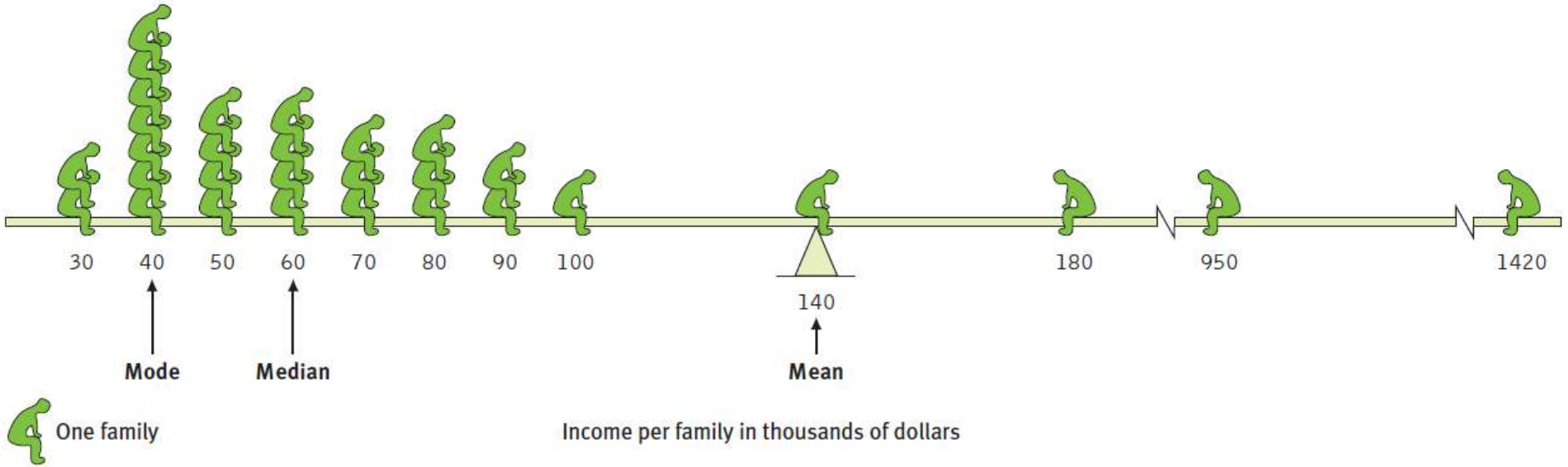


Descriptive Statistics

Measures of Central Tendency

- Mean (arithmetic average)
- Median (middle score)
- Mode (occurs the most)
- Skewed distribution



Descriptive Statistics

Measures of Variability

- Range
- Standard Deviation

$$\text{Standard deviation} = \sqrt{\frac{\text{Sum of (deviations)}^2}{\text{Number of scores}}}$$

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

Standard deviation =

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

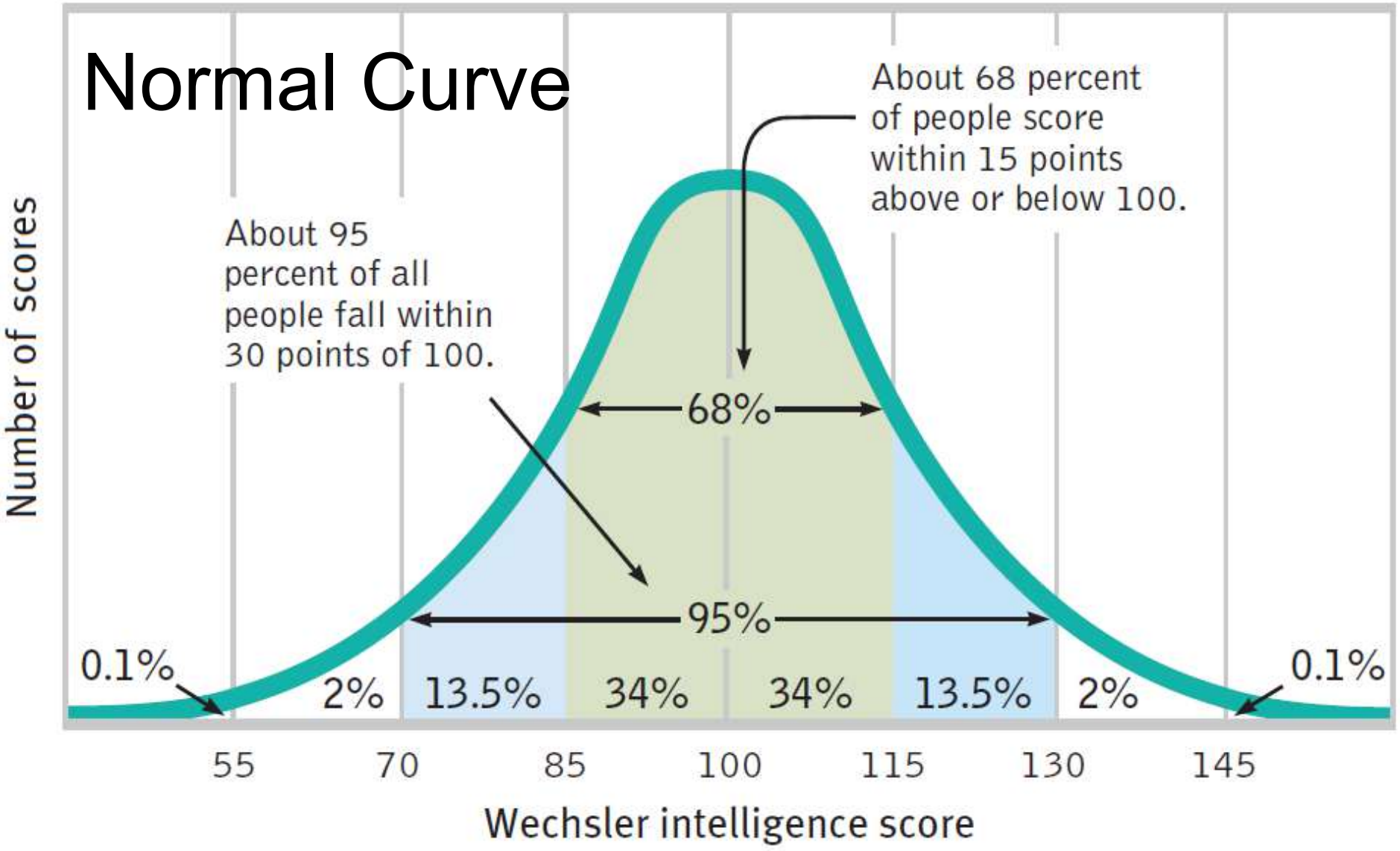
Mean = 640 ÷ 8 = 80

Standard deviation =

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

Descriptive Statistics

Measures of Variability



When Is an Observed Difference Reliable?

- Inferential statistics
- Representative samples are better than biased samples
- Less-variable observations are more reliable than those that are more variable
- More cases are better than fewer

Inferential Statistics

When Is a Difference Significant?

Statistical significance

- The averages are reliable
- The differences between averages is relatively large
- Does imply the importance of the results

Psychology Applied

- Can laboratory experiments illuminate everyday life?
  - The principles, not the research findings, help explain behavior
- Does behavior depend on one's culture and gender?
  - Culture
  - Gender

Ethics in Research

Ethics in animal research

- Reasons for using animals in research
- Safeguards for animal use

AP Photo/Mary Altaffer

Ethics in Research

- Ethics in human research
  - Informed consent
  - Protect from harm and discomfort
  - Maintain confidentiality
  - Debriefing

Hindsight Bias

= the tendency to believe, after learning an outcome, that one would have foreseen it.

- Also known as the “I knew it all along” phenomenon.

Critical Thinking

= thinking that does not blindly accept arguments and conclusions. Rather, it examines assumptions, discerns hidden values, evaluated evidence, and assesses conclusions.

Theory

= an explanation using an integrated set of principles that organizes observations and predicts behaviors or events.

Hypothesis

= a testable prediction, often implied by a theory.

Operational Definition

= a carefully worded statement of the exact procedures (operations) used in a research study.

- For example, human intelligence may be operationally defined as what an intelligence test measures.

Replication

= repeating the essence of a research study, usually with different participants in different situations, to see whether the basic finding extends to other participants and circumstances.

Case Study

= an descriptive technique in which one individual or group is studied in depth in the hope of revealing universal principles.

Naturalistic Observation

= observing and recording behavior in naturally occurring situations without trying to manipulate and control the situation.

Survey

= a technique for ascertaining the self-reported attitudes or behaviors of a particular group, usually by questioning a representative, random sample of the group.

Sampling Bias

= a flawed sampling process that produces an unrepresentative sample.

Population

= all the cases in a group being studied, from which samples may be drawn.

- Note: Except for national studies, this does NOT refer to a country's whole population.

Random Sample

= a sample that fairly represents a population because each member has an equal chance of inclusion.

Correlation

= a measure of the extent to which two factors change together, and thus of how well either factor predicts the other.

Correlation Coefficient

= a statistical index of the relationship between two things (from -1.0 to +1.0).

Scatterplot

= a graphed cluster of dots, each of which represents the values of two variables. The slope of the points suggests the direction of the relationship between the two variables. The amount of scatter suggests the strength of the correlation (little scatter indicates high correlation).

Illusory Correlation

= the perception of a relationship where none exists.

Experiment

= a research method in which an investigator manipulates one or more factors (independent variables) to observe the effect on some behavior or mental process (the dependent variable). By *random assignment* of participants, the experimenter aims to control other relevant factors.

Experimental Group

= in an experiment, the group that is exposed to the treatment, that is, to one version of the independent variable.

Control Group

= in an experiment, the group that is NOT exposed to the treatment; contrasts with the experimental group and serves as a comparison for evaluating the effect of the treatment.

Random Assigment

= assigning participants to experimental and control groups by chance, thus minimizing preexisting differences between those assigned to the different groups.

Double-Blind Procedure

= an experimental procedure in which both the research participants and the research staff are ignorant (blind) about whether the research participants have received the treatment or the placebo. Commonly used in drug-evaluation studies.

Placebo Effect

= experimental results caused by expectations alone; any effect on behavior caused by the administration of an inert substance or condition, which the recipient assumes is an active agent.

- Latin for “I shall please”

Independent Variable

= the experimental factor that is manipulated; the variable whose effect is being studied.

Confounding Variable

= a factor other than the independent variable that might produce an effect in an experiment.

Dependent Variable

= the outcome factor; the variable that may change in response to manipulations of the independent variable.

Validity

= the extent to which a test or experiment measures or predicts what it is suppose to.

Descriptive Statistics

= numerical data used to measure and describe characteristics of groups. Include measures of central tendency and measures of variability.

Histogram

= a bar graph depicting a frequency distribution.

Mode

= the most frequently occurring score(s) in a distribution.

Mean

= the arithmetic average of a distribution, obtained by adding the scores and then dividing by the number of scores.

Median

= the middle score in a distribution, half the scores are above it and half are below it.

Skewed Distribution

= a representation of scores that lack symmetry around their average value.

Range

= the difference between the highest and lowest score in a distribution.

Standard Deviation

= a computed measure of how much scores vary around the mean score.

Normal Curve

= a symmetrical, bell-shaped curve that describes the distribution of many types of data; most scored fall near the mean (68 percent fall within one standard deviation of it) and fewer and fewer near the extremes.

- Normal distribution

Inferential Statistics

= numerical data that allow one to generalize – to infer from sample data the probability of something being true to a population.

Statistical Significance

= a statistical statement of how likely it is that an obtained result occurred by chance.

Culture

= the enduring behavior, ideas, attitudes, and traditions shared by a group of people and transmitted from one generation to the next.

Informed Consent

= an ethical principle that research participants be told enough to enable them to choose whether they wish to participate.

Debriefing

= the postexperimental explanation of a study, including its purpose and any deceptions, to its participants.