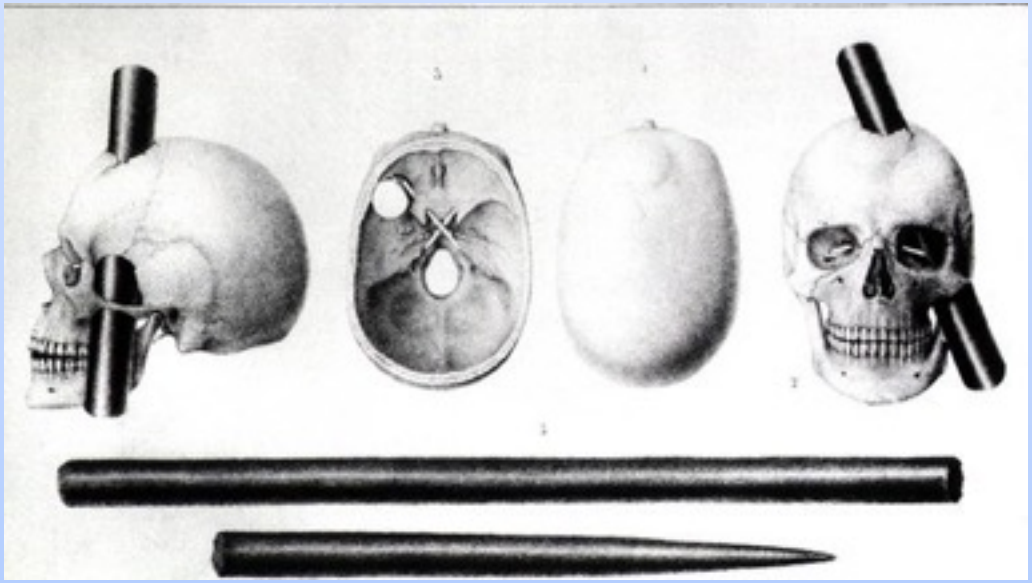
Research Methods: Safeguards against Error

The case of Phineas Gage



Types of Research Design

- Naturalistic
- Case Study
- Self Reports

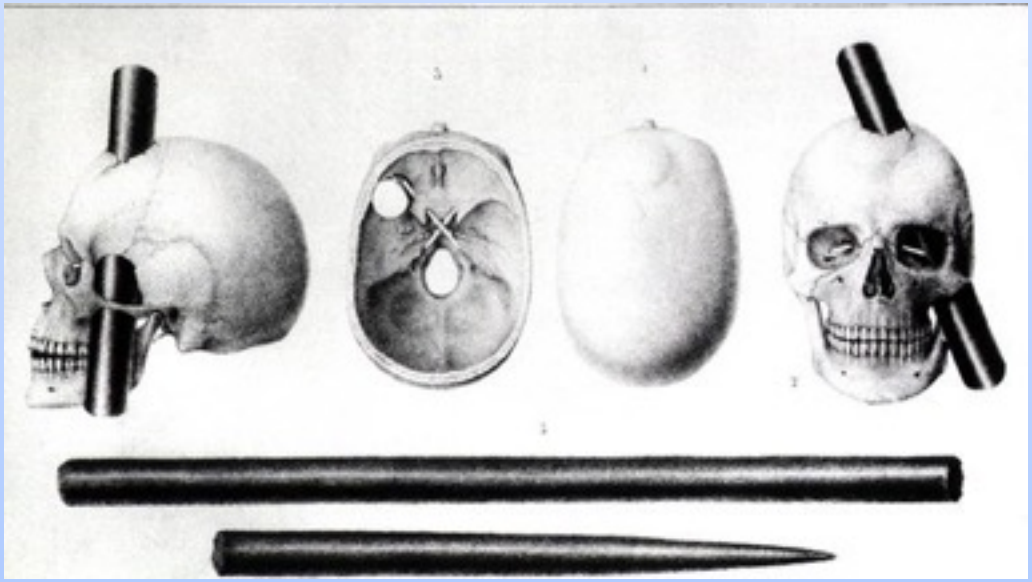
Naturalistic Observation

- **Watching behavior in real-world settings**
- High degree of **external validity** *is the* extent to which we can **generalize** our findings **to the real world**
- Low degree of **internal validity** - extent to which we can draw **cause-and-effect inferences**

Case Study Designs

- Studying one person or a small number of people for an extended period of time
  - Depth is traded for breadth
- Common with **rare types** of **brain damage** or **mental illness**
- **Helpful** in providing **existence proofs**

Identify a famous a case study?



What was the hypothesis?

Self Report Measures and Surveys

Psychologists often need to ask people about themselves or others

- **Self-report measures** or questionnaires asses characteristics such as personality or mental illness
- **Surveys ask about a person's opinions or abilities**

What would be a drawback to for self report measures?

The key to **generalizability** in a **survey** or a **questionnaire study** is…

Random Selection

Random Selection

- **Ensures every person** in a **population** has an **equal chance** of being chosen **to participate**
- **Non**-random selection can **skew results** and make them **inaccurate** when **applied to the population as a whole**

Evaluating Measures

- To trust results, the measures must have:
  - ✓ **Reliability**—consistency of measurement
  - ✓ **Validity**—extent to which a **measure assesses what it claims to measure**

- A test must be reliable to be valid, but a reliable test can still be completely invalid

Hope
Love of Truth
Imitation
Wonder
Esteem
Sublimity
Cause
Ideality
Cautiousness
Wit
Time
Acquisition
Tune
Making
Prudence
Friendship
Courage
Parental Love

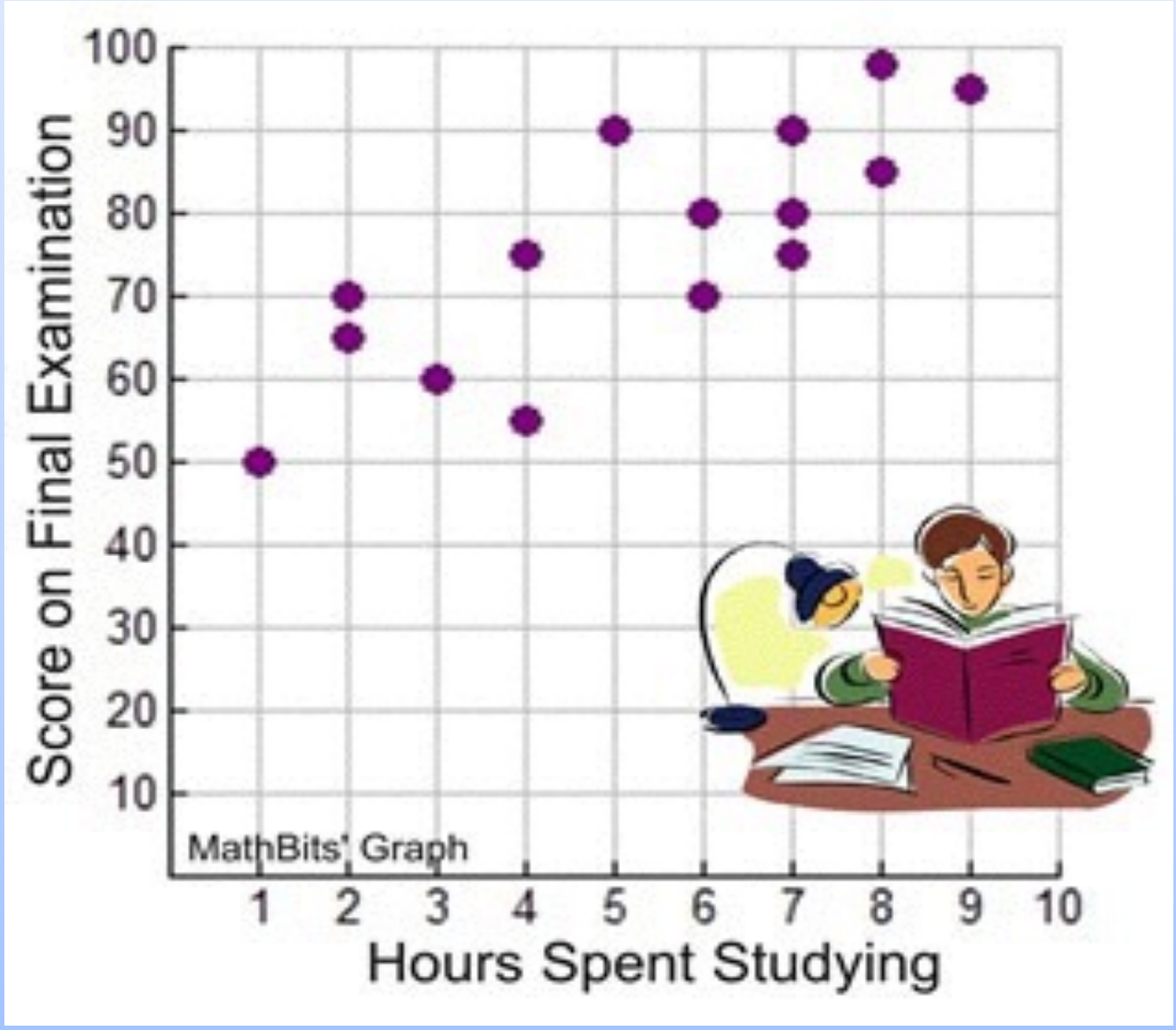
Were Phrenologist the testing measures **reliable?**

A test must be reliable to be valid, though a **reliable test** can still be completely **invalid**.

Correlational Designs

- Examine how two variables are related
- Correlations vary from -1 to +1 and can be
  - Positive (as one increases, so does the other)
  - Negative (as one increases, the other decreases)
  - **Zero** (**no relationship** *between* **variables**)
- Depicted in a scatterplot

scatterplot



Determining Causation

- The only way to determine if one thing is caused another is through an **experimental design**.
- In an experiment, you **purposefully manipulate variables**, rather than just measure already existing differences.

Pitfalls of Experimental Design

Placebo effect - improvement resulting from the mere expectation of improvement

- Subjects must be **blind**

Pitfalls of Experimental Design

Experimenter expectancy effect is when researchers' hypotheses lead them to **unintentionally bias** a study outcome

- Clever Hans, the mathematical horse
- Rosenthal's intelligent mice

Double-blind design

Statistics

The Language of Research

Statistics: The Language of Research

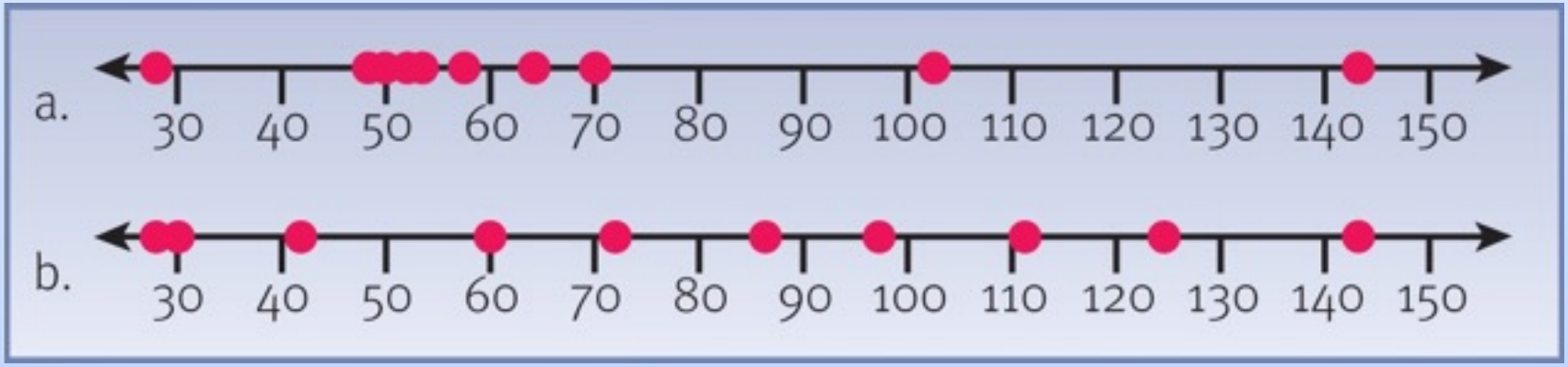
- Descriptive statistics—numerical characteristics of the nature of the data set

- Central tendency—where the group tends to cluster
  - **Mean: average** of all scores
  - **Median: middle scores** in the data set
  - **Mode: most frequent** score in the data set

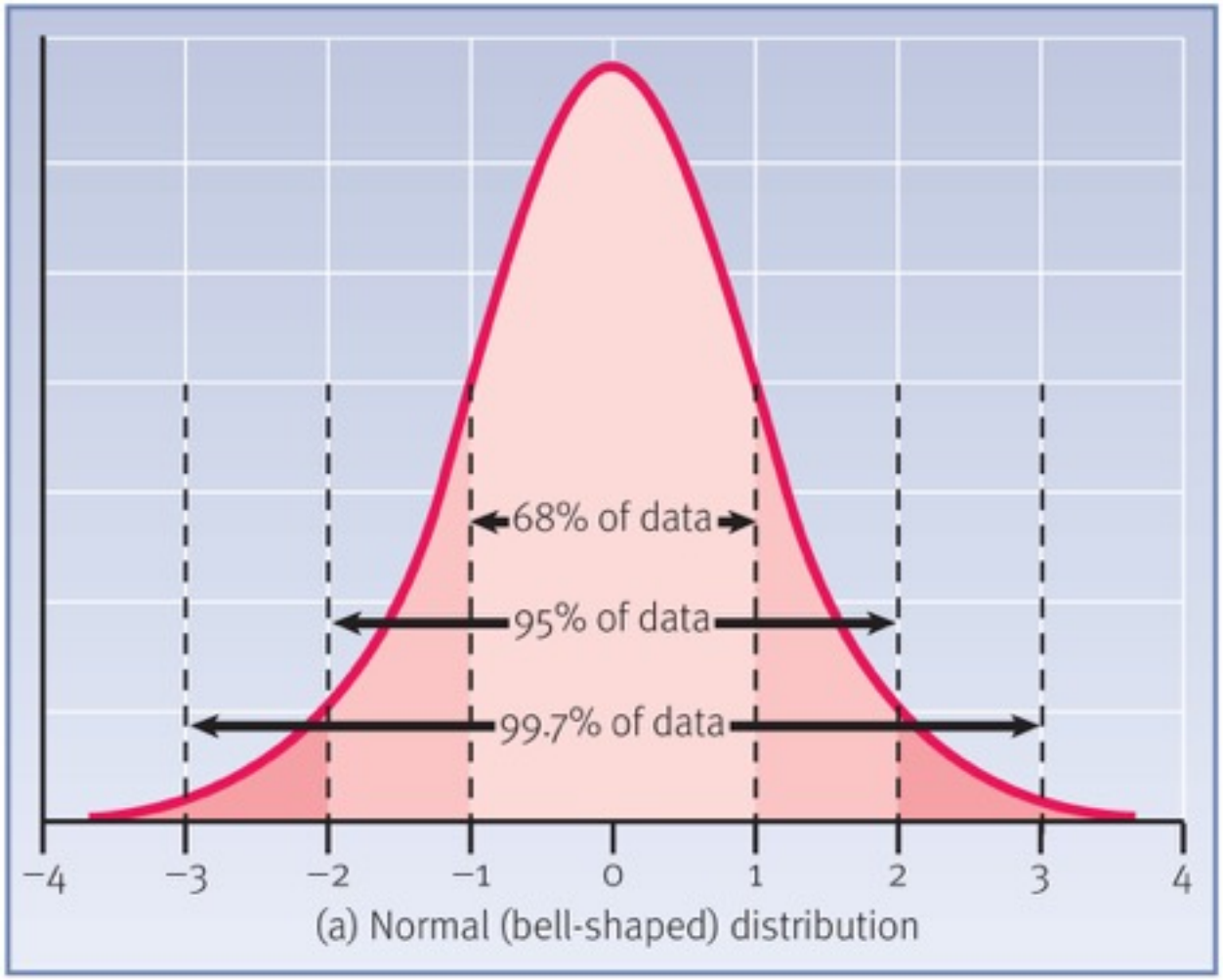
Statistics: The Language of Research

- Dispersion—sense of how loosely or tightly bunched scores are
- Range—difference between the highest and lowest scores
- Standard **deviation—measure of dispersion** that takes into account **how far each data point is from the mean**

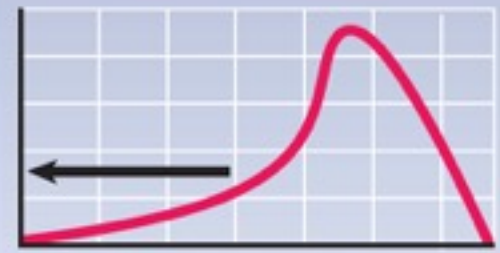
Range vs. Standard Deviation



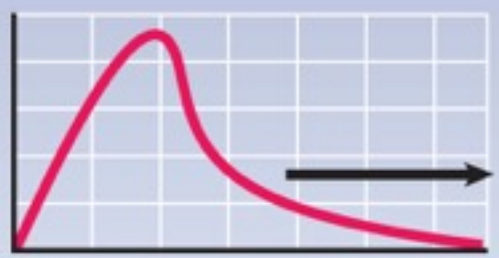
- Both sets of data have the same range, but very different SDs
- SDs assist us to see how the numbers are distributed



(a) Normal (bell-shaped) distribution



(b) Negative skew
Elongated tail at the **left**
More data in the tail than would be expected in a normal distribution



(c) Positive skew
Elongated tail at the **right**
More data in the tail than would be expected in a normal distribution

An example of how stats help conceptualize information.

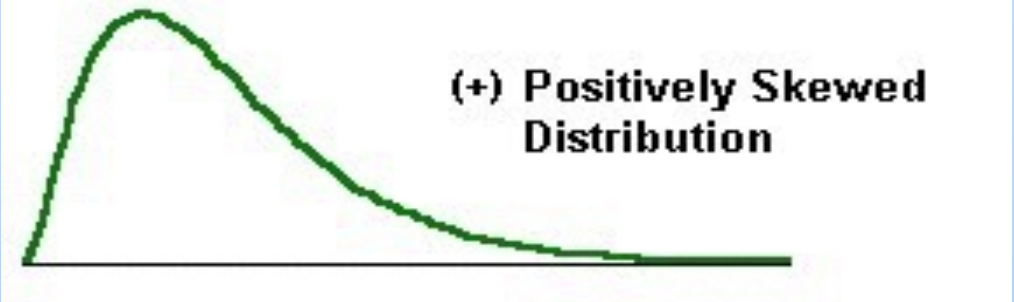
- **You are looking for work, and see a job advertising that the average (mean) income in their community of employees make $148,888,889. Do you apply for the job?**

- What is the Median?
- What is the Mode?

Annual income of income the 9 employees:

$ 20,000
$ 25,000
$ 30,000
$ 30,000
$ 40,000
$ 45,000
$ 50,000
$ 100,000
$ 1,000,000

Mean: $148,888,889

Median: $35,000

Mode: $30,000