# Research Methodologies

## What is Psychology?

- **Psychology** = study of behavior and mental processes
- Not explicitly limited to humans; can be any cognitively advanced organism

### Goals of Psychology

- Describe
- Explain
- Predict
- Control

### Scientific Method

1. Come up with a **testable** question
    - Must be testable – if it isn't, it's not science
    - Come up with a hypothesis = an assertion about a phenomenon
2. Design a study
    - Study must collect data to analyze
    - Data should prove or dispove hypothesis
3. Analyze data
    - Conclusions come from this analysis
4. Report Results
    - Publication in a journal

### Theory vs Hypothesis

- **Theory** = a set of well-supported hypotheses that explain a phenomenon
- **Hypothesis** = an assertion about a particular aspect of a phenomenon
    - Can be rejected or accepted

### Operational Definition

- An explicit, well-defined expounding of the procedures in an experiment
- Important for studies to be repeatable

### Replication

- a re-do of a study to retest the hypothesis or account for variables not accounted for by the original study

## Types of studies

### Case Study

- An in-depth study of the details of one particular subject
- Hopefully, findings for the one can be generalized to the population
- Advantages:
  - A lot of information/data to study
- Disadvantages:
  - Conclusions cannot necessarily be generalized to others

### Survey

- A collection of self-reported data from individuals
- Random sampling is very important
- Wording Effect
  - The wording of questions can drastically change the responses
- False Consensus Effect
  - A human tendency to overestimate the extent to which people agree with them
- **Population** = all the members in a group
  - Different from **samples**, which are the sub-groups that are derived from the population
- Sampling
  - Randomly select members of a population and assign them to samples
  - Protects against selection bias
  - Helps to make data more process-able
- Advantages:
  - Easy way to get a lot of data
- Disadvantages:
  - Very hard to get random sampling correct
  - Need people to be honest

**Naturalistic Observation**

- Record and observe from a distance, without knowledge of the participents
- Advantages:
  - Natural behavior = no behavioral bias
- Disadvantages:
  - No direct communication with participents

**Experiment**

- Searching for a causation between two variables
- "Randomized Controlled Trial"
- Placebo
  - A method to help prevent placebo affect from tampering with results
- Double-Blind Procedure
  - Participents shouldn't know whether they are in experimental or control group
  - Helps to prevent placebo affect from being different between the two groups
- Advantages:
  - Demonstrates causation
- Disadvantages:
  - Very difficult to prove causation

Correlations - A relationship between two variables - Does NOT imply a causal relationship - **Correlation Coefficient(r)** = measure of how strong/consistent the correlation is * Ranges between -1 and 1 - Type 1 Error: * You think there's a relationship, but there isn't * *false positive* - Type 2 Error: * There is a relationship, but you think there isn't * *false negative*

## Ethics of Psychology

1. Do no harm.
2. Accurately describe risks to potential subjects.
3. Ensure that participation is voluntary.
4. Minimize any discomfort to participants.
5. Maintain confidentiality.
6. Do not unnecessarily invade privacy.
7. Remove any misconceptions caused by deception (debrief).
8. Provide results and interpretations to participants.
9. Treat participants with dignity and respect.

## Distributions

**Percentile Ranking** - the percentage of scores that are below yours

Bar Graphs - Also referred to as "historgram"

**Mode** = the most frequent element in a set of data - Any dataset a *can* have multiple modes

**Mean** - defined as $\frac{\sum_{i=1}^{n} E_i}{n}$

**Median** - Middle element * If two middles, average the two - Half of elements are above; half are below

**Range** - Defined as $E_{max} - E_{min}$

**Standard Deviation** - Metric of how much the elements vary from mean

**Statistical Significance** - An arbitrary error bound for determining whether or not a correlation is strong enough to publish

### Distribution Skewing

Positive Skewed Distribution - High extremes - Average moves to right

Negatively Skewed Distribution - Low extremes - Average moves to left