Chapter 2: The Research Enterprise in Psychology
This Weeks Objective

- I will be able to relay the concepts learned about psychology’s history and research method’s (in group activities, individual assignments and on tests)
What are Some Questions You Have About Human Behavior or Why People Do What They Do?
Some Research Topics

• How does anxiety affect people’s desire to be with others (affiliation need)?
• Do different cultures react differently to stress?
• Is the onset of cancer more likely after a stressful life event?
The Scientific Approach: A Search for Laws

• Basic assumption: events are governed by some lawful order (for instance people’s behavior under stress) that can be uncovered

• Goals of Scientific Approach:
  – 1 Measurement and description of a phenomenon (school performance). How do I measure it? And, what exactly is it?
  – 2 Understanding and predicting why an event occurs-These predictions are called hypotheses
Understanding and Prediction

**Hypothesis** = A tentative statement about two or more variables—a tentative statement about how things work (Students that eat chocolate perform better on memory tests—what are the two variables here?) - an educated guess, a prediction.

**Variable** = any measurable conditions, events, characteristics or behaviors that are controlled or observed in a study.
RESEARCH

**Applied Research** = has clear, practical application

- The goal is to apply the research results and control positive or negative situations, immediate, real world application
- So, if it is found that students who eat breakfast perform better, schools will initiate a breakfast program (*Applied Research*)

**Basic Research** = looks at questions of interest that may not have immediate, real world application

- How does anxiety affect people’s desire to be with others (affiliation need)?
- Do different cultures react differently to stress?
It depends on the data. But, in general, the mean is usually the most useful measure of central tendency.

But, the mean is distorted by extreme (outliers) scores.
- 3 Application and Control

• The goal is to apply the research results and control positive or negative situations.
• So, if it is found that students who eat breakfast perform better, schools will initiate a breakfast program.
• If we observe there is a relationship between breakfast eaters and performance we formulate a theory.
• **Theory** explains organized observations and predicts behavior or events; these only change as new information becomes available (green eggs are best). These are more permanent—have considerable facts to support it.
The Scientific Method: Terminology

- **Operational definitions** are used to clarify precisely what is meant by each variable (define breakfast, school performance)
- **Participants or subjects** are the organisms whose behavior is systematically observed in a study
- **Population** - all students in Broward County. This is where the participants come from
- **Data collection techniques** allow for empirical observation and measurement
- **Statistics** are used to analyze data and decide whether hypotheses were supported
The Scientific Method: Terminology

- Findings are shared through reports at **scientific meetings** and in **scientific journals** – periodicals that publish technical and scholarly material
  - Advantages of the scientific method: clarity of communication and relative intolerance of error
- **Research methods**: general strategies for conducting scientific studies
Evaluating Research: Methodological Pitfalls

Distortions in self-report data (subjects verbal accounts of their behavior, such as is the case with surveys, interviews, or personality inventories):

- **Social desirability bias** = tendency to give socially approved answers to personal questions
- **Response set** = tendency to respond to questions in a particular way that is unrelated to the content of the question (agreeing with almost everything on a questionnaire)

**Hawthorne Effect** = changes in subjects behavior due to the attention of researcher (having control and experimental groups help)
<table>
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<tr>
<th>Technique</th>
<th>Description</th>
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<td>Direct observation</td>
<td>Observers are trained to watch and record behavior as objectively and precisely as possible. They may use some instrumentation, such as a stopwatch or video recorder.</td>
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<td>Questionnaire</td>
<td>Subjects are administered a series of written questions designed to obtain information about attitudes, opinions, and specific aspects of their behavior.</td>
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<td>Interview</td>
<td>A face-to-face dialogue is conducted to obtain information about specific aspects of a subject’s behavior.</td>
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<td>Psychological test</td>
<td>Subjects are administered a standardized measure to obtain a sample of their behavior. Tests are usually used to assess mental abilities or personality traits.</td>
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<td>Physiological recording</td>
<td>An instrument is used to monitor and record a specific physiological process in a subject. Examples include measures of blood pressure, heart rate, muscle tension, and brain activity.</td>
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<tr>
<td>Examination of archival records</td>
<td>The researcher analyzes existing institutional records (the archives), such as census, economic, medical, legal, educational, and business records.</td>
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I’m Hungry
Experimental Research: Looking for Causes

• **Experiment** = manipulation of one variable under controlled conditions so that resulting changes in another variable can be observed (feeding one group of students)
  – Detection of cause-and-effect relationships

• **Independent variable (IV)** = variable manipulated (food)

• **Dependent variable (DV)** = variable affected by manipulation (school performance)
  – How does X (food) affect Y (performance)?
  – X = Independent Variable, and Y = Dependent Variable
Evaluating Research: Methodological Pitfalls

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Variables

Independent variable
A condition or event that an experimenter varies (food) in order to see its impact on another variable

Dependent variable
The variable that is thought to be affected (school performance) by manipulation of the independent variable
Identify the Independent and Dependent Variables

1. Riding the bus to school makes students more intelligent
2. Kids who view aggressive cartoons are more likely to act aggressively
3. AP Psychology students who eat chocolate perform better on a memory test of unrelated words
Independent and Dependent Variables

1. Riding the bus to school (IV) makes students more intelligent (DV)
2. Kids who view aggressive cartoons (IV) are more likely to act aggressively (DV)
3. AP Psychology students who eat chocolate (IV) perform better on a memory tests of unrelated words (DV)
What are the *operational* definitions?

1. Riding the bus to school makes students more intelligent
2. Kids who view aggressive cartoons are more likely to act aggressively
3. AP Psychology students who eat chocolate perform better on vocabulary tests
Experimental and Control Groups: The Logic of the Scientific Method

• **Experimental group** (the group that receives some special treatment in regard to the independent variable-chocolate given)

• **Control group** (similar subjects but is the group that does not receive the special treatment given to the experimental group-no chocolate given)

• EVERYTHING ELSE FOR THESE TWO GROUPS MUST BE THE SAME
Experimental and Control Groups: The Logic of the Scientific Method

– **Random Sampling** = everyone in the population has an equal chance of being selected as a subject

– **Random assignment** = all subjects have an equal chance of being assigned to any group or condition in the study

– Manipulate independent variable for one group only (give chocolate)

– Resulting differences in the two groups **must** be due to the independent variable
Experimental and Control Groups:  
The Logic of the Scientific Method

Extraneous and confounding variables

**Extraneous Variables** = any variables other than the independent variables that seem likely to influence the dependent variable in a specific study (lighting in room, color of room, participants regularly that have the same effect as chocolate)

**Confounding Variables** = two variables are linked together in a way that make it difficult to sort out their specific effects (students that rode the bus to school socialized more which made them perform better)
Figure 2.5 The basic elements of an experiment

Hypothesis:
Anxiety increases desire to affiliate

Random assignment
Subjects randomly assigned to experimental and control groups

Manipulation of independent variable
Experimental group
“Shocks will be very painful” (high anxiety)

Control group
“Shocks will be mild and painless” (low anxiety)

Measurement of dependent variable
High-anxiety group indicated a desire to wait with others more than did low-anxiety group

Conclusion:
Anxiety does increase desire to affiliate
Experimental Designs: Variations

- **Expose a single group to two different conditions** (same group tests with chocolate than without chocolate—they are their own control group)
  - Reduces extraneous variables
- **Manipulate more than one independent variable**
  - Allows for study of interactions between variables (while the experimental group gets chocolate, both groups also eat a piece of bread)
- **Use more than one dependent variable** (measure their performance in school and their degree of satisfaction in school)
  - Obtains a more complete picture of effect of the independent variable
Figure 2.6  Manipulation of two independent variables in an experiment
Reliability—same results when study is replicated

Validity—are we testing what we say we are testing in the form of the independent variables (the lighting in the room is different for the control and experimental group)
What do you think are some of the strengths of the experimental method?
What do you think are some of the weaknesses of the experimental method?
Strengths and Weaknesses of Experimental Research

• Strengths:
  – conclusions about the relationships of cause-and-effect can be drawn

• Weaknesses:
  – artificial nature of experiments
  – ethical and practical issues
Descriptive/Correlational Methods: Looking for Relationships

• **Methods** used when a researcher cannot manipulate the variables under study
  – Naturalistic observation
  – Case studies
  – Surveys

• Allow researchers to describe patterns of behavior and discover links or associations between variables but cannot imply causation

• **Experimental Method** - correlation not causation
### Figure 2.10  Comparison of major research methods

<table>
<thead>
<tr>
<th>Research method</th>
<th>Description</th>
<th>Example</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Experiment</td>
<td>Manipulation of an independent variable under carefully controlled conditions to see whether any changes occur in a dependent variable</td>
<td>Youngsters are randomly assigned to watch a violent or nonviolent film, and their aggression is measured in a laboratory situation</td>
<td>Precise control over variables; ability to draw conclusions about cause-and-effect relationships</td>
<td>Contrived situations often artificial; ethical concerns and practical realities preclude experiments on many important questions</td>
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<td>Naturalistic observation</td>
<td>Careful, usually prolonged observation of behavior without direct intervention</td>
<td>Youngsters’ spontaneous acts of aggression during recreational activities are observed unobtrusively and recorded</td>
<td>Minimizes artificiality; can be good place to start when little is known about phenomena under study</td>
<td>Often difficult to remain unobtrusive; can’t explain why certain patterns of behavior were observed</td>
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<td>Case studies</td>
<td>In-depth investigation of a single participant using direct interview, direct observation, and other data collection techniques</td>
<td>Detailed case histories are worked up for youngsters referred to counseling because of excessive aggressive behavior</td>
<td>Well-suited for study of certain phenomena; can provide compelling illustrations to support a theory</td>
<td>Subjectivity makes it easy to see what one expects to see based on one’s theoretical slant; clinical samples often unrepresentative</td>
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<tr>
<td>Surveys</td>
<td>Use of questionnaires or interviews to gather information about specific aspects of participants’ behavior</td>
<td>Youngsters are given questionnaires that describe hypothetical scenarios and are asked about the likelihood of aggressive behavior</td>
<td>Can gather data on difficult-to-observe aspects of behavior; relatively easy to collect data from large samples</td>
<td>Self-report data often unreliable, due to intentional deception, social desirability bias, response sets, memory lapses, and wishful thinking</td>
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</table>
Advantages/Disadvantages of these (naturalistic observation, case studies, surveys)

Descriptive/Correlational Methods:

**Advantage:**
- A way to explore questions that cannot be examined with experimental methods (poor maternal nutrition and birth defects)
- It broadens the scope of what researchers can study
- **Disadvantage:** Cannot control events to isolate cause and effect; cannot demonstrate conclusively that two variables are causally related (one causes the other)
Other Methods You Need to Know (Changes in Memory as people Age)

**Longitudinal Study**
- Follow a group of people from adulthood through old age.
  What might be the problem here

**Cross Sectional Study**
- Select people from varying ages groups (20s, 30s, 40s, 50s, 60s and 70s)
  What might be the problem here?
Statistics and Research: Drawing Conclusions

- **Statistics** – using mathematics to organize, summarize, and interpret numerical data
  - **Descriptive statistics**: organizing and summarizing data (measures of central tendency, measures of variability, and the coefficient of correlation)
  - **Inferential statistics**: interpreting data and drawing conclusions (More about this later)
Descriptive Statistics: Measures of Central Tendency

- **Measures of central tendency** = typical or average score in a distribution (say of the test given to chocolate eaters)
- **Mean**: arithmetic average of scores
- **Median**: score falling in the exact center
- **Mode**: most frequently occurring score
  - Which do you think most accurately depicts the typical?
It depends on the data. But, in general, the mean is usually the most useful measure of central tendency.
Central Tendency

• When do you think the mean is not a good measure of central tendency?
Extreme high or low scores called outlyers
Figure 2.11  Measures of central tendency

Mode (most frequent)

Median (middle)

Mean (arithmetic average)

\[ 300,000 \div 5 = 60,000 \]
Descriptive Statistics: Variability

- **Range** = the difference between the highest and lowest scores
- **Variability** = how much scores vary from each other and from the mean
  - **Standard deviation** = numerical depiction of variability
    - High variability in data set = high standard deviation
    - Low variability in data set = low standard deviation
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<thead>
<tr>
<th>Speed (miles per hour)</th>
<th>Set A</th>
<th>Set B</th>
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- **Mean**
  - Set A: 35
  - Set B: 35

- **Standard deviation**
  - Set A: 2.87
  - Set B: 10.39

Figure 2.12 Variability and the standard deviation
Correlation Coefficients
When 2 variables are related to each other, they are correlated

- **The Purpose of Correlational Studies:**
  Correlational studies are used to look for relationships between variables. There are three possible results of a correlational study: a positive correlation (closer to +1), a negative correlation (closer to -1), and no correlation(0). The correlation coefficient is a measure of correlation strength and can range from –1.00 to +1.00.

- **Positive Correlations:** Both variables increase or decrease at the same time. A correlation coefficient close to +1.00 indicates a strong positive correlation. **Studying and good grades (say +92)**

- **Negative Correlations:** Indicates that as the amount of one variable increases, the other decreases (and vice versa). A correlation coefficient close to -1.00 indicates a strong negative correlation. **Cutting class and good grades (say -.93)**

- **No Correlation:** Indicates no relationship between the two variables. A correlation coefficient of 0 indicates no correlation. The **number of stuffed animals owned and good grades**
Figure 2.14  Interpreting correlation coefficients
Correlation

• **Correlation** *(correlation coefficient)*
  – How well does A predict B
  – Positive versus negative correlation
  – Strength of the correlation
    • -1.0 to +1.0
  – **Scatterplot**s are used to show correlation
Correlation

HEIGHT AND TEMPERAMENT OF 20 MEN

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Correlation

Correlation graph showing the relationship between height in inches and temperament scores.

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**Height and Temperament of 20 Men**

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Correlation
Correlation

No relationship (0.00)
Correlation

Perfect positive correlation (+1.00)
Correlation

Perfect positive correlation (+1.00)
Correlation

Perfect negative correlation (-1.00)
Correlation

Perfect negative correlation (-1.00)
Correlation: Prediction, Not Causation

- Higher correlation coefficients - the closer to 1 (+ or -) = increased ability to predict one variable based on the other. **Prediction is a goal of research.**
  - SAT/ACT scores moderately correlated with first year college GPA
- 2 variables may be highly correlated, but not causally related
  - Foot size and vocabulary positively correlated in children
  - Do larger feet cause larger vocabularies, or vice versa?
  - The third variable problem (what is it here)?
Larger feet belong to older children. Older children have better vocab. than younger, smaller foot children!!!
Correlation

Correlation and Causation

• Correlation helps predict
  – Does not imply cause and effect
Figure 2.15  Three possible causal relationships between correlated variables
Inferential Statistics: Interpreting Data and Drawing Conclusions

- **Inferential Statistics** are used to interpret data and draw conclusions; **IS** are used by researchers to see if the results may be due to influences of chance.
- **Hypothesis testing**: do observed findings support the hypotheses? Are differences between the **experimental group** (those who eat chocolate) and the **control group** (no chocolate) by chance?
- **Statistical significance** = when the probability that the observed findings are due to chance is very low.
  - Are findings real or due to chance?
    - Very low = less than 5 chances in 100, which is referred to as the .05 level of significance.
Evaluating Research: Methodological Pitfalls

• **Replication** = repeat a study to see if earlier results are duplicated (this is why the operational definitions are important)

• **Sample** = collection of subjects selected for observation in an empirical study (AP psych students selected from all schools in Broward County)

• **Population** = larger collection of animals or people from which a sample is drawn (all AP students in Broward) that researchers want to generalize about
Evaluating Research: Methodological Pitfalls

- **Sampling bias** = the sample is not representative of the population from which it is drawn (I only take AP Students from Everglades to do my study—it is not a representative sample of all AP students in Broward County)—I CANNOT DRAW CONCLUSIONS HERE!

- **Placebo effects** = participants’ expectations lead them to experience some change (do better on a test), regardless of the Independent Variable
Figure 2.16 The relationship between the population and the sample
Evaluating Research: Methodological Pitfalls

- **Distortions in self-report data** (subjects verbal accounts of their behavior, such as is the case with surveys, interviews, or personality inventories):
  - **Social desirability bias** = tendency to give socially approved answers to personal questions
  - **Response set** = tendency to respond to questions in a particular way that is unrelated to the content of the question (agreeing with almost everything on a questionnaire)
Evaluating Research: Methodological Pitfalls

- **Experimenter bias** = researchers expectations about the outcome of a study influences the results (they see what they want to see, can influence the subjects responses-I smile more and treat the chocolate eaters better)
  - **the double-blind procedure** = neither subject or experimenter know which group is the control or experimental group
Ethics in Psychological Research: Do the Ends Justify the Means?

• The question of **deception** (is it okay to make subjects think they are hurting others)
  
  Is it more important to advance knowledge or be honest???

• The question of **animal research**
  – Controversy among psychologists and the public

• Ethical standards for research: the **American Psychological Association**
  – Ensures both human and animal subjects are treated with dignity
Ethical Issues

• Institutional Review Board (reviews and approves or denies all proposed animal and human research methods and objectives based on ethical issues and study’s value)

• Debriefing (explaining to subjects the purpose of, and any deception in, the research as soon as the research is over)
A subject’s participation in research should be voluntary and based on informed consent. Subjects should never be coerced into participating in research. They should be informed in advance about any aspects of the study that might be expected to influence their willingness to cooperate. Furthermore, they should be permitted to withdraw from a study at any time if they so desire.

Participants should not be exposed to harmful or dangerous research procedures. This guideline is intended to protect subjects from psychological as well as physical harm. Thus, even stressful procedures that might cause emotional discomfort are largely prohibited. However, procedures that carry a modest risk of moderate mental discomfort may be acceptable.

If an investigation requires some deception of participants (about matters that do not involve risks), the researcher is required to explain and correct any misunderstandings as soon as possible. The deception must be disclosed to subjects in “debriefing” sessions as soon as it is practical to do so without compromising the goals of the study.

Subjects’ rights to privacy should never be violated. Information about a subject that might be acquired during a study must be treated as highly confidential and should never be made available to others without the consent of the participant.

Harmful or painful procedures imposed upon animals must be thoroughly justified in terms of the knowledge to be gained from the study. Furthermore, laboratory animals are entitled to decent living conditions that are spelled out in detailed rules that relate to their housing, cleaning, feeding, and so forth.

Prior to conducting studies, approval should be obtained from host institutions and their research review committees. Research results should be reported fully and accurately, and raw data should be promptly shared with other professionals who seek to verify substantive claims. Retractions should be made if significant errors are found in a study subsequent to its publication.

Figure 2.17 Ethics in research
Your Turn:

Work in groups of four
Design an experimental study that will have a:
1. Hypothesis
2. Independent and dependent variables
3. Operational definitions for all variables
4. Who is your population?
5. From where did you get your sample?