PSY 250: Research Methods

Introduction
Chapter 1

Class Requirements

- 3 Exams
  - 25% each
  - Total 75% of grade
  - Not cumulative
- Research Design Presentation Assignment (25%)
  - Design original experiment and give 10 min presentation on your rationale and methodology
  - No written component
- 8 credits Sona research participation

Conducting Research

“The wise man doesn't give the right answers, he poses the right questions.”

Claude Levi-Strauss

- The allure of answering “mysteries”, resolving debates, contributing to knowledge
- To construct a properly designed, well controlled experiment is, for the psychologist, like constructing a beautiful building is for the architect

Why is the Research Methods Course Important?

- It is the methodology used by behavioral scientists such as psychologists
- It assists you in other classes
  - The more completely you understand research methodology, the better you will be able to master the material in your other classes.
  - Becoming a Knowledgeable Consumer of Research
- Understanding brief descriptions of studies
- Getting into Graduate School
- Conducting a research project after graduation
### Non-Scientific Ways to Acquire Knowledge

- **Tenacity**
  - Continued presentation of a particular bit of information
  - When we hear a statement repeated a sufficient number of times, we have a tendency to accept it as being true.
- **Superstition**
  - E.g. breaking a mirror = 7 years bad luck
  - "You can’t teach an old dog new tricks"

### Non-Scientific Ways to Acquire Knowledge cont.

- **Authority**
  - Accepting knowledge from authority figures
  - Acceptance of knowledge from an authority; taking someone’s word for it; also depends on the credibility of the person presenting the information.
  - Parents, teachers/professors, mechanics, spiritual leaders etc.
  - Football player selling soup etc.

### Non-Scientific Ways to Acquire Knowledge cont.

- **Method of Faith**
  - Extension of method of authority
  - Have complete faith in authority figure
  - E.g. young children have absolute faith in answers given by parents
  - Involves accepting another’s view of the truth without verification

### Non-Scientific Ways to Acquire Knowledge cont.

- **Intuition**
  - Information accepted as true because “it feels right”
  - Hunch and instinct
  - Roulette player "feels like" number 23 is going to come up
Problems

- What problems can you identify with acquiring knowledge through tenacity, intuition, and authority?
  - You have no way of knowing if the knowledge you have gained is true.
  - The inability or unwillingness of tenacity and authority to change in the face of contradictory evidence.
  - Authorities can be biased
    - E.g. conflicting testimony by expert witnesses
    - Differing opinions of doctors
  - Experts aren’t always really experts

Non-scientific ways of knowing cont.

- Reason and Logic
  - Based on the premise that we can apply reason and logic to a situation in order to gain knowledge and understanding
  - This process is frequently called a logical syllogism.
  - An example of a logical syllogism is the assumption that “beautiful people are good.”

Non-scientific ways of knowing cont.

- Rational Method
  - Seek answers by logical reasoning

<table>
<thead>
<tr>
<th>Argument</th>
<th>Premise statements</th>
<th>Logical conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socrates is a man</td>
<td>All men are mortal</td>
<td>Therefore, Socrates is mortal</td>
</tr>
<tr>
<td>Dinosaurs are animals</td>
<td>All animals are in zoos</td>
<td>Therefore, dinosaurs are in zoos</td>
</tr>
</tbody>
</table>

- Logic may be sound but conclusion may not be true if premise statements are incomplete or inaccurate

Non-scientific ways of knowing cont.

- Experience/Empiricism
  - Process of learning through direct observation and experience
  - All knowledge acquired through the senses

BUT

- It is common for people to misperceive or misinterpret world
Optical Illusions

- https://www.youtube.com/watch?v=y2-EB4PGUs8
- https://www.youtube.com/watch?v=PxGB2Zz4R04
- https://www.youtube.com/watch?v=ffrBY2Xs1LU
- https://www.youtube.com/watch?v=b3Lla-KrM0E
Hering-Helmholtz Illusion

Ebbinghaus Illusion

Non-scientific ways of knowing cont.

- Experience/Empiricism cont.
  Problems:
  - Objective experience in conflict with subjective belief
    - E.g. vegetarian eats delicious dish without knowing it had meat in it
  - Make accurate observations but misinterpret what you see
    - E.g. sun rising in east and setting in west – misconception that sun travelled around the earth
  - Time-consuming, sometimes dangerous
    - E.g. eating poisonous mushrooms

Scientific Ways to Acquire Knowledge

- Science
  - The key elements of the scientific approach are:
    - Formulating specific questions
    - Objective, systematic measurements of the phenomenon under consideration
    - The ability to verify or confirm the measurements made by other individuals
    - Self-correction of errors and faulty reasoning
    - Exercising control to rule out the influence of unwanted factors
Commonsense Psychology

- Our culture is full of psychological conclusions that are more based on commonsense than science
- “Smart kids sit in front of the class”
- How are these conclusions made?
- What are the problems?
- How can we test scientifically?

The Scientific Method

1. Observe Behavior or Phenomena
   - Casual observation of own or other’s behavior or events (empiricism)
   - Inductive reasoning
     - Generalize beyond actual observations
     - Use small set of observations to form general statement about larger set of possible observations
     - E.g. students not paying attention in back of class – maybe good students DO sit at the front!

2. Form Hypothesis
   - A statement that describes or explains a relationship between or among variables
   - Identify other factors/variables associated with your observation
   - Background research (authority)
   - Choose most plausible or interesting explanation

3. Use Hypothesis to Generate Testable Prediction
   - Use logic to make prediction
   - Deductive Reasoning – begin with universal statement and make specific deductions
   - Must be possible to demonstrate that prediction is either correct or incorrect – for prediction to be testable, both outcomes must be possible
The Scientific Method

4. Evaluate Prediction by making Systematic, Planned Observations
   - Empirical method
   - Research or data collection phase
   - Provide fair, unbiased test of hypothesis by observing whether predictions are accurate

5. Use Observations to Support, Refute, or Refine Original Hypothesis
   - Compare actual observations with predictions
   - Circle back to step 2 (hypothesis formation)
   - Circular vs. linear process

Question

- How does the scientific method avoid the problems associated with tenacity, authority, intuition, experience, and reason & logic?

Components of the Scientific Method

- Objectivity
  - select research participants to avoid biasing factors (such as age or sex).
  - Researchers make their measurements with instruments in order to be as objective as possible. - empirical because they are based on objectively quantifiable observations.
  - Observations are systematic and structured in such a way as to rule out competing explanations
Components of the Scientific Method

- **Confirmation of Findings**
  - Observations must be made public in order to be evaluated by others.
  - Because the procedures and measurements are objective, we should be able to repeat them and confirm the original results. Confirmation of findings is important for validity.

- **Replication**
  - A research study conducted in exactly the same manner as a previous study.
  - A replication with extension generates new information at the same time it confirms previous findings.

Components of the Scientific Method

- **Self-correction**
  - Errors and faulty reasoning that become apparent should lead to a change in the conclusions we reach.
  - If experimental evidence fails to support the predicted relations between our independent and dependent variables, we change our view about how nature operates.

Components of the Scientific Method

- **Control**
  - Direct manipulation of factors of major interest.
    - An experiment is an implementation of control by manipulating the factor(s) that is the central focus of research.
  - Control of unwanted factors
    - Potentially influential and undesirable factors (other than the factor of major interest) are not allowed to change.

Components of the Scientific Method (recap)

- **Objectivity**
- **Control**
- **Confirmation of findings**
- **Self-correction**
### The Research Process

#### Theoretical Considerations
- **A theory** is a formal statement of the relationship(s) among the relevant variables in a particular research area. All good theories:
  - Attempt to organize a given body of scientific data.
  - Point the way to new research.

### The Research Process: Step 2

#### Hypothesis
- States a testable prediction about the relations between the independent and dependent variables in your experiment.
- Specific aspect of larger theory.
- **The research or experimental hypothesis** is the predicted outcome of a research project.

### Elements of A Good Hypothesis

#### Logical
- Should be a logical conclusion of logical argument.
- Know basic facts, theories, predictions, and methods that make up the knowledge base for your topic area.
- Logical argument:
  - Provides rationale or justification for your hypothesis.
  - Establishes connection between your research and previous research results.

#### Testable
- Must be possible to observe and measure all of the variables involved.
- Must involve real events and individuals, cannot involve hypotheticals.
Elements of A Good Hypothesis

3. Refutable/Falsifiable
- Must be possible to obtain results that contradict your hypothesis
- NOT hypotheses involving moral or religious issues, value judgments, hypothetical situations etc.
- E.g. There is an animal somewhere that has a theory of mind

4. Positive
- Must make positive statement about existence of something – usually existence of a relationship, difference, or treatment effect
- Fail to find convincing evidence vs. stating that relationship does not exist
- Showing absence of effect is not same as showing effect does not exist – failure to prove guilt does not = evidence of innocence, but can prove guilt

The Research Process

- The more deeply you immerse yourself in a research area, the more questions and problems you will find to research
- There are no final answers!