

PSY 250: Research Methods

Introduction
Chapter 1

Class Requirements

- 3 Exams
 - 25% each
 - Total 75% of grade
 - Not cumulative
- Research Paper (25%)
 - Design original experiment and write up your rationale and methodology APA style
- 10 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

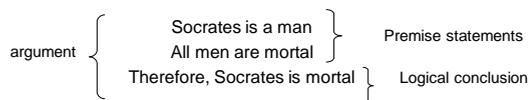
- What problems can you identify with acquiring knowledge through tenacity, intuition, and authority?
 - You have no way of knowing if the knowledge you have gained is true.
 - The inability or unwillingness of tenacity and authority to change in the face of contradictory evidence.
 - Authorities can 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



Dinosaurs are animals
All animals are in zoos
Therefore, dinosaurs are in zoos

- 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

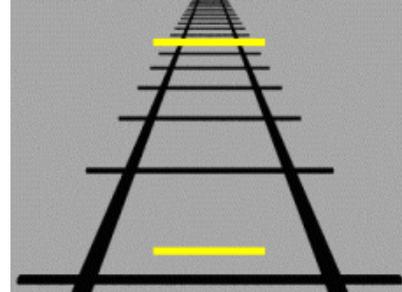
BUT

- It is common for people to misperceive or misinterpret world

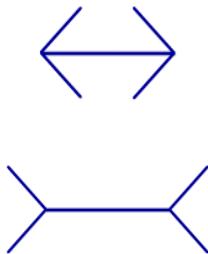
Optical Illusions

- http://www.slate.com/blogs/bad_astronomy/2013/12/15/optical_illusion_motion_using_vertical_slits.html
- <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>

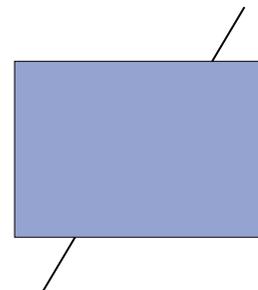
Ponzo Illusion



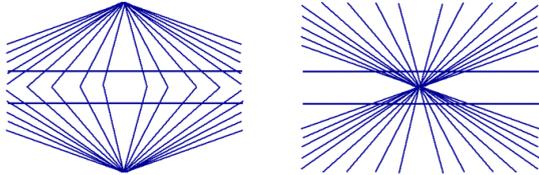
Muller-Lyer Illusion



Poggendorf Illusion



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!

The Scientific Method

- 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

The Scientific Method

- 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

The Scientific Method

- 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

- 1. Logical
 - Should be logical conclusion of logical argument
 - Know basic facts, theories, predictions and methods that make up knowledge base for your topic area
 - Logical argument
 - provides rationale or justification for your hypothesis
 - establishes connection between your research and previous research results

Elements of A Good Hypothesis

- 2. Testable
 - Must be possible to observe and measure all of the variables involved
 - Must involve real events and individuals, can not 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

Elements of A Good Hypothesis

- 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!