Psychology 020
Chapter 2 & Appendix
Research Methods & Descriptive Statistics
Tues. Sept. 18, 2007

SCIENCE

- Peer-reviewed
- maintain rigorous standards for honesty & accuracy
- Reproducible results demanded
- Failures are searched for and studied closely
- Over time, more is learned about processes under study
- Convinces by evidence or logical reasoning

VS.

PSEUDOSCIENCE

- Not peer-reviewed
- Does not maintain rigorous standards for honesty & accuracy
- Results cannot be verified
- Failures are hidden or excused
- No contributing to knowledge
- Convinces only through 'belief' or 'faith'

THEORIES & HYPOTHESES

- Theories - Frameworks for explaining events
  - Formal statements that explain how & why certain events are related
  - Theories are broader than hypotheses
- Hypothesis - Tentative explanation/ prediction
- Variable
  - The factor you want to explore
  - Operational Definition
    - How you are specifically going to define/measure your variable
      - Aggression → # of punches? # of verbal threats?

Characteristics of a Good Theory

- Incorporate existing fact, Theory is testable, Supported by new research (if not, theory must be reworked), Parsimonious (simplest possible)
- Theories are not necessarily true (Must be validated)

STEPS IN SCIENTIFIC RESEARCH

- Initial observation/question
- Form hypothesis
- Test hypothesis
  - conduct research

- Analyze data
  - Do results support the hypothesis?
- Do further research & build a theory
  - Adjust theory on the basis of new findings

SAMPLES

- a part of a population, or group that a researcher wants to study & make inferences about.
- GOOD SAMPLES:
  - RANDOM - each person has equal chances of being in the sample.
  - REPRESENTATIVE - same characteristics as general population.

TYPES OF RESEARCH DESIGN

DESCRIPTIVE DESIGN

- SURVEYS - interviews & questionnaires
- Types of Surveys
  - TELEPHONE
    - Fast & efficient
    - Interviewer bias
  - MAIL
    - Avoids interviewer bias
    - Response rate low
  - PERSONAL INTERVIEW
    - Flexibility (adjust on-the-fly for individual)
    - Costly and interviewer bias
- ALL Descriptive designs have a potential participant response bias.
- Likert Scale: range of choices on a continuum
- Forced-Choice: limited options (True/False)

DATA COLLECTION METHODS

- NATURALISTIC OBSERVATION
  - careful observation and recording of behavior in real-life settings
    - e.g., watching children in daycare
    - Advantages:
      - Behaviour is observed where it typically occurs
    - Disadvantages:
      - Can't establish cause & effect
      - Costly to run
      - Observer interference
- CASE STUDY
      - In-depth examination of one person
    - Advantages:
      - Enables intensive study of rare phenomena
    - Disadvantages:

- Generalizability of the findings is questionable
- Potential researcher bias
- Ethics approval difficult to secure

RESEARCH DESIGN

1. Correlations
   - Assess relationships between *naturally occurring variables*
     - You can measure two variables & then compute a correlation to see if there is a meaningful relationship
   - Addresses questions such as
     - How does one behaviour relate to the occurrence of another behaviour?
     - Know one behaviour, predict the another?

   Advantages: Allows study of relationships that cannot be manipulated or controlled.
   Disadvantages: Cannot assess cause and effect relationships.
   - E.G.: Drownings and ice cream consumption are correlated, but one does not cause the other; something else probably causes both (Summertime)

   Correlation Coefficient: See online diagrams; Can be 'strong' or 'weak', 'positive' or 'negative' or 0

2. The Experiment
   - Assess cause-effect relationships between 2 or more variables
     - Researcher manipulates one variable
     - Researcher then measures whether this variable produces changes in another variable
     - The researcher attempts to control for other factors that might influence the results
- Why do we care about cause & effect?
  - Do treatments really work?
- Compare experimental group to *control group:* Control for effects of random chance, placebo effects, etc.

THE VARIABLES IN EXPERIMENTS

- Independent Variable (IV)
  - The variable manipulated by the experimenter
    e.g. Alcohol consumption
- Dependent Variable (DV)
  - The variable effected by the independent variable.
    e.g. Hand-eye coordination

GOOD EXPERIMENTS HAVE:

- Reliability
  - Stability & Consistency
- Internal Validity
  - The IV truly causes the changes in the DV

- External Validity
  - You can generalize your results
- Construct Validity
  - Your measure is truly tapping the variable you want to assess

DIFFERENT WAYS TO DO RESEARCH

- SETTING
  - Field Study
  - Lab
- DATA
  - Self-Report (Surveys, Interviews)
  - Observation
- DESIGN
  - Descriptive
  - Correlational
  - Experimental

APPENDIX:

AFTER DATA COLLECTION: ARE THE FINDINGS MEANINGFUL?

Null Hypothesis Testing

- Assume there are no differences between groups
  - All conditions are the same
- The groups won't all have the EXACT same #s
  - If there are no real differences, how much would they differ just by chance?
- We use statistics to determine what size of a difference is likely by chance
  - If the differences between our groups is larger than what we'd expect by chance → we reject the idea that our conditions are all the same (i.e. reject Null hypothesis)
    - Conclude we have real group differences
    - (i.e. support the alternative hypothesis)

The Goal is to 'eliminate' the Null Hypothesis (i.e., provide evidence our Alternate Hypothesis is the correct one)

DESCRIPTIVE STATISTICS

CENTRAL TENDENCY

1. Mean: average of all scores (sum of scores and divide by N)
2. Median: the middle value of a range of scores arrayed lowest to highest
3. Mode: the most common score

MEASURES OF VARIABILITY

1. Range: how far apart the lowest and highest score are
2. Variance: variation of each score from the mean (on average): equation in diagrams
3. Standard deviation: square root of the variance

THE NORMAL CURVE (See Diagrams)

- Perfectly symmetrical histogram; mean, median and mode are therefore the same, and at the middle of the graph
- Allows us to see where individual values lie within the distribution
- Percentile rank: describes the % of scores that were lower than a particular score
- Z-score: compares one score to the rest of the distribution (1 Z = 1 Standard Deviation)

* Lecture diagrams for equations and graphs

ETHICS IN RESEARCH

- Research with Humans
- Informed Consent
    - Process
    - Potential risks
    - Freedom to withdraw from study
- Freedom from coercion
- Confidentiality & Anonymity
- Minimize harm/discomfort
- Debriefing

- ETHICAL ISSUES
    - When should Deception be used?
    - When should "risky" studies be done?

RESEARCH WITH ANIMALS

- Only when necessary (Only when data critical to helping humans)
- Maintain health of animals, in experiments & animal housing
- Humane treatment is essential