Methods

Research designs

- Two broad classes
  - Observational
    - Researcher studies the world as it is (more or less)
    - Case studies, correlational studies, quasi-experiments
  - Experimental
    - Researcher manipulates the world, somehow
    - Then measures the effects of the manipulation

Experimental designs

- Manipulate a variable, then compare the different conditions to measure the effects
- Ideally, conditions should match on all variables other than the manipulated one
- An experiment involves a manipulation
  - If you can identify the manipulation, it’s an experiment. If you can’t, it isn’t

Elements of an experiment

- A variable: Something whose value can change
  - Testosterone exposure, rape survivor decisions, family environment, amount of practice, ...
- Independent variable: What you manipulate
  - Each value is a level, helps define a condition
  - If there are two independent variables, each with two levels, how many conditions?
    - $2 \times 2 = 4$

Elements of an experiment

- Dependent variable: What you measure
  - “Depends” on the independent variable
- Confounding variable: A variable that doesn’t match across groups
  - And that isn’t an independent variable
  - A good design has as few confounds as possible

Example 1

- Independent variable(s)?
  - Hormone (levels: ghrelin vs. control)
  - Picture type (levels: food vs. non-food)
  - Conditions:
    - ghrelin-food, ghrelin-nonfood,
      control-food, control-nonfood
- Dependent variable(s)?
  - Brain activation while looking at pictures
  - Memory for the pictures after seeing them
Example 1

- Possible confounding variables?
  - Suppose only the ghrelin group got an injection
    - The injection itself could affect appetite
    - So give a sham dose to control group
  - Suppose the groups were run at different times
    - Control group @ 10am
    - Ghrelin group @ 11am
    - Ghrelin group may be growly before lunch
    - Have to control for time of day

Internal validity

- An experiment has good *internal validity* if
  - there are no obvious confounding variables
  - Conditions are as closely matched as possible at
    - the start of the experiment
    - So you can conclude that the manipulation
    - caused any condition differences

Two types of manipulations

- **Between subjects**
  - Each subject participates in one condition
  - Subjects are randomly assigned to conditions
- **Within subjects**
  - Each subject participates in all conditions
  - Each matches conditions in different ways
    - And has different strengths and weaknesses

Between-subjects manipulation

- Subjects are *randomly assigned* to conditions
  - For each subject, flip a coin to see which condition they are assigned to
  - Random assignment helps cancel differences
    - Suppose Alice shows up at the experiment hungry
    - With random assignment, each condition should have roughly equal numbers of hungry people
    - If the sample is large enough

Within-subjects manipulation

- Each person participates in all conditions
  - So in one sense conditions are perfectly matched
  - But participating in one condition may change someone for the other conditions
    - E.g., they've already seen the pictures once
      - So need different sets of stimuli
    - E.g., an injection your first visit to the lab may change your attitude toward the second
      - So counterbalance: Have different subjects participate in different orders

Example 1

- What kind of design did they use?
  - Probably *mixed*:
    - Hormone between, picture type within
  - To manipulate hormone within, you’d need to:
    - Counterbalance the order of sessions
    - Develop two complete sets of pictures
Example 2

- Independent variable(s)?
  - Virtual scene type (alcohol vs. neutral)
- Dependent variable(s)?
  - Level of craving

Example 3

- Question: Which are more aggressive, boys or girls?
- Can we answer this with an experiment?
  - No: Can’t manipulate a child’s sex
  - The design has to be a quasi-experiment
    • Like a between-subjects design, but groups are intact
    • Have to be especially concerned about confounds

External validity

- A study has good *external validity* if it reflects the world as it is
  - In terms of participants, materials, and procedure
  - Let’s us conclude that the results apply to situations we care about
- Example 2:
  - Claim was that external validity was high because they used virtual reality and smells

Defining a variable

- Definition should be *operational*
  - There are specific rules for measuring it
  - *E.g.*, Rules for measuring aggression
- Definition should have *construct validity*
  - The variable should measure the construct you’re interested in
  - *E.g.*, Do we count playful acts that only *simulate* aggression?