Methods

Announcement

• Staff change:
  – The research participation coordinator is now Ms. Jenny Babbitt, babbit7@msu.edu
  – Syllabus has been updated online

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
• By definition, 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
• Dependent variable: What you measure
• Confounding variable: A variable that doesn’t match across groups (and isn’t an IV)
  – A good design has as few as possible

Example 1

• Independent variable(s)?
  – Hormone (levels: ghrelin vs. control)
  – Picture type (levels: food vs. non-food)
  – The design has $2 \times 2 = 4$ conditions:
    • ghrelin-food, ghrelin-nonfood, control-food, control-nonfood
• Dependent variable(s)?
  – Brain activation while looking at pictures
  – Memory for pictures, afterwards
Example 1

Possible confounding variables?

– Suppose only the ghrelin group got an injection
  • May make people nervous in ways that could affect appetite
  • Probably have to give a sham dose to control group
– Suppose the groups were run at different times
  • Control group @ 10am
  • Ghrelin group @ 11am
  • Control group was a little closer to breakfast
  • Have to control for time of day

Two types of manipulations

• Between subjects
  – One 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

Within-subjects design

• 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
  – The hormone manipulation was between
    • A within design would’ve been pretty complicated
  – The picture type manipulation was within
    • A within design is easy
    • Especially if the hormone manipulation was between

Internal validity

• An experiment has good internal validity if there are no obvious confounding variables
  – I.e., conditions should be as closely matched as possible at the start of the experiment
  – So that after the experiment you can conclude that the manipulation caused any condition differences

Between-subjects design

• 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
Example 2

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

Example 2:

 Claim was that external validity was high because they used virtual reality and smells

External validity

• A study has good *external validity* if it reflects the world as it is
  – In terms of participants, materials, and procedure
  – Lets us conclude that the results generalize to relevant situations
• Example 2:
  – Claim was that external validity was high because they used virtual reality and smells

Example 3

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

Defining a variable

• A definition should be *operational*
  – Give specific rules for measuring it
  – E.g., Rules for measuring aggression
• A 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?