

Problem identification & Hypothesis Formation

- What does a study require?
 - Identify the problem/form hypothesis
 - Design experiment
 - Conduct experiment
 - Test hypothesis
 - Communicate results

How to create hypothesis

- Topic interest
 - Consider multiple perspectives
 - Brainstorm new ideas
 - Formulate formal relationships
 - State independent and dependent variables
 - How each is measured
 - Relationships between two
 - How relationship will be tested

More precise, the better

- What effect does the environment have on learning styles?
- What effect does the amount of exposure to words have on the speed with which they are learned?
- Shift from concepts to operational definitions.

My toothpaste works better than
yours.

- What needs to be defined more precisely?
- What evidence is needed?
- What questions must we answer before we can design a study?

Operationalization

- Explicit definition
 - What it is, what is it not
- How measure it
 - Self-report
 - Behavioral (Behavioroid)
 - Physiological
 - Speed of processing
 - GSR

What is a reasonable problem?

- Expresses a relationship between two or more variables.
- Forms a question
 - What is the effect of
 - Under what conditions do
 - Does the effect of
- Can be tested empirically
 - Can it be measured?
 - Can it be falsified?

Change following questions?

- Is God dead?
- Are humans naturally good?
- Do we get what we deserve in life?

What is a good idea?

- Correspondence with reality
- Coherence
- Parsimony
- Falsifiability
- Can answer empirically
- Know what acceptable answer looks like
- Worth answering

Role of theory (Popperian approach)

- Theory must be stated so that it can be falsified
- Theories can only be falsified, not proven
- Theories evolve as add or replace outmoded formulations
- If hypothesis does not receive support, it means that the current form of theory is wrong
- If repeatedly not supported, should be discarded
- Look for better theory to account for results
- Good theories account for most of the observations

What makes research (practically) significant?

- Outcome of investigator interest, resolve and effort
- Often based on intuition
- Outcome of intellectual rigor
- Goes into world and returns with something clear, tangible and well understood
- Concerned with theory, understanding and explanation
- Focuses on real problems

What questions are worth asking?

- How interesting?
- How important?
- Will it work?
- Do we have the resources

- Be bold, be bold, be bold (Aronson)

Will idea “pay off”?

- Common sense
- Critical feedback from colleagues
- Familiar with relevant literature
- Feasibility
 - Time required
 - Type of research participants
 - Expense
 - Expertise
 - Ethical sensitivity

Things to avoid:

- Do not choose method before question
- Do not get embroiled with how to analysis data
- Do not try to capture journal policies
- Do not use self-report for all variables
- Be wary of posing questions that can not be answered
- Avoid asking questions for an answer already known
- Avoid investigation problems just because feasible
- Avoid adding one more “moderator”.
- Avoid fads (follow your heart).

Where can we get ideas?

- Everyday life
- Practice issues
- Past research
- Theory
 - Intensive case study
 - Paradoxical incident
 - Metaphor
 - Rule of thumb
 - Account for conflicting results

Beware (and perhaps use) own circumstances

- What tools do we have available
- Our shared view of the world
- Personal psychological inclinations
- Wall (1926)
 - Preparation
 - Incubation
 - Illumination
 - verification

Experimental Design

- 2 requirements
 - Manipulation
 - Independent vs. dependent variables
 - Control
 - Random assignment
 - Control extraneous variables

Definitions

- Independent variable:
 - The variable that is hypothesized to influence the dependent variable. Participants are treated identically except for this variable.
- Dependent variable:
 - The response that is hypothesized to depend on the independent variable. All participants are measured on this variable.

Definitions

- Internal validity:
 - Did the independent variable really cause the dependent variable?
 - Mundane vs. experimental realism
 - General (possible) vs. specific (probable)

Threats to internal validity

- Maturation
- History
- Mortality
- Testing
- Changes in instrumentation
- Regression to the mean

Regression to the mean

- Tendency for people to score close to the mean on a second test than they did on the first.
 - Leadership training example
 - Bright parents have a child
 - Sesame street example

And if people are aware of two
groups...

- Imitate treatment
- Compensation
- Demoralization
- Compensatory rivalry

Is random assignment possible in the field?

- Expect a lottery (dorm assignment)
- Demand outstrips supply (magnet school)
- Innovation can not be delivered all at once (access to cable)
- Experimental group can be temporally isolated.
- Experimental group can be spatially spirited.
- Change is require but no solution are known
- When a tie can be broken (who gets into program)
- When people in the participant pool do not express a preference.

Where to begin

- Participants
- Experimental setting
- Treatment (manipulation)
- Dependent measure (s)
- Manipulation check (s)

Types of design

- Judgment
- Observational
- “High impact”

Tips for Design

- Types of treatments
 - Instructional sets
 - Event that happens
 - Impact vs. control
 - Plausibility
 - Alternative explanations
- Types of dependent measures
 - Self reports
 - Behavior

What might manipulate?

- Social environment
- Physical environment
- Instructions
- Subject variables

What might measure?

- Speed of completing task
- Number of errors made
- Ratings or evaluations
- Amount of money donated
- Number of hours
- Note focus on “continuous variables”
- Borrow from those who came before

Extraneous variables

- Could eliminate influence (test only men)
- Try to keep influence constant (same rate of presentation)
 - Some variables can not be clearly measured
 - Some variables change as study progresses
- Add it to design
 - Counterbalance or randomize presentation

Participant effects

- Motivation
 - Need to understand
 - Need to look good
- Placebo effects
- Sophistication
- Sources of information
 - Cover story
 - “control” vs. comparison groups

Possible solutions

- Design manipulations to appear identical
- Give participants a “false” hypothesis
- Remove dependent variable from experimental situation
- Ask participant to serve as experimenter
- Use behavior measures
- Avoid pre-tests
- Ask participants to be honest

Experimenter effects

- Experimenter attributes
- Experimenter expectancies

Possible Solutions

- Use naïve experimenters
- Keep experimenter blind to experimental condition
- Keep experimenter blind to measurement
- “standardized instructions
- Run all conditions simultaneously

Tips for Design

- Types of treatments
 - Instructional sets
 - Event that happens
 - Impact vs. control
 - Plausibility
 - Alternative explanations
- Types of dependent measures
 - Self reports
 - Behavior

Tips from the classics

- Effective settings are coherent, simple, involving
- Break frame of study (half way encounters, etc)
- Recognize experimenter's role
- Use behavioroid measures
- View as creating a play
- Keep experimenter blind to experimental condition
- Give participants a way to make sense

More issues to think about...

- Manipulation strength
- Treatment integrity
- Treatment effectiveness
- Manipulation checks
- Post experiment interview

How are participants assigned to independent variable

- Between groups
- Within groups

Comparing designs

- **Between Groups**
- No order, carryover, practice effects
- Requires more people
- Individual differences are hopefully random
- **Within Groups**
- Much more powerful so need fewer people
- Control for individual differences

Good research practices (Hall, 1984)

- Enthusiasm
- Open mindedness
- Common sense
- Role talking ability
- Inventiveness
- Confidence in one's own judgment
- Consistency and care about details
- Ability to communicate
- Honesty
- (No mention of data analysis skills!)

Self-criticism (Dunn, 2002)

What is significant?

What are the underlying assumptions?

What has been overlooked? Evidence?

Alternative viewpoints?

How can it be improved?

What are the implications of the predicted results?

What are the applications of the predicted results?