Cosby & Bates: Methods in Behavioral Resarch (11th)

Research Fundamentals
Ch. 4

Summer 2014

Variables

What is a variable?

- variable – *any event, situation, behavior, or individual characteristic that varies*
- sounds kind of vague… What does that mean? Examples?
  - age, gender, stress, anger, reaction time, perceived distance
- must have at least 2 values

- some variables are easy to define and measure
  - effects of exercise on blood pressure

- but in psychology, often we are interested in abstract things
  - What is hunger?

- In a research study, would a good way of measuring hunger be to ask participants "Are you hungry?"

Constructs and Operational Definitions

- construct – an abstract concept
  - memory, happiness, depression, sociability
  - How can we measure?
    - turn into a behavior we can directly observe and measure
    - e.g., happiness?
- operational definition – the specific way we are going to measure a construct
  - e.g., number of times a person smiles in 10 minutes, need system to know what counts as a smile
- what could be an operational definition of aggression?

<u>Group Activity</u>

- Males and females may differ in their approaches to helping others. For example, males may be more likely to help a person having car trouble, and females may be more likely to bring dinner to a sick friend.
  - Develop two operational definitions for the concept of helping behavior, one that emphasizes the "male style" and the other the "female style." (e.g., What could you do in a laboratory experiment to measure helping, that would emphasize the "male style" or the "female style"?)
- How might the use of one or the other lead to different conclusions from experimental results regarding who helps more, males or females?
- What does this tell you about the importance of operational definitions?

(originally adapted from Cozby, 2007)

Experimental vs. Nonexperimental Methods

- experiment – a research study involving direct manipulation and control of variables
- Bushman (2005)
  - participants watched a TV show containing violence (e.g., Cops), sex (e.g., Sex in the City), or no violence or sex (e.g., America's Funniest Animals)
  - there were commercials during the TV show
  - afterwards, they were given a memory test about the brands
- experiments can determine whether one variable affects the other variable
  - sex and violence affect memory for brands

- nonexperimental methods:
  - observational research
  - survey research
  - correlational research
- find out about behavior as it occurs naturally
- do not manipulate anything
- Geller, Russ, and Altomari (1986) observed college students' drinking behavior in bar and party settings
- Steinberg and Dornbusch (1991) asked students questions about their work hours and GPA

- "Correlation does not imply causation!"
- correlation only tells us that two variables are related, but not <u>why</u> they are related
- cause-and-effect conclusions can only be drawn if a variable is manipulated/controlled by the researcher (an experimental design)
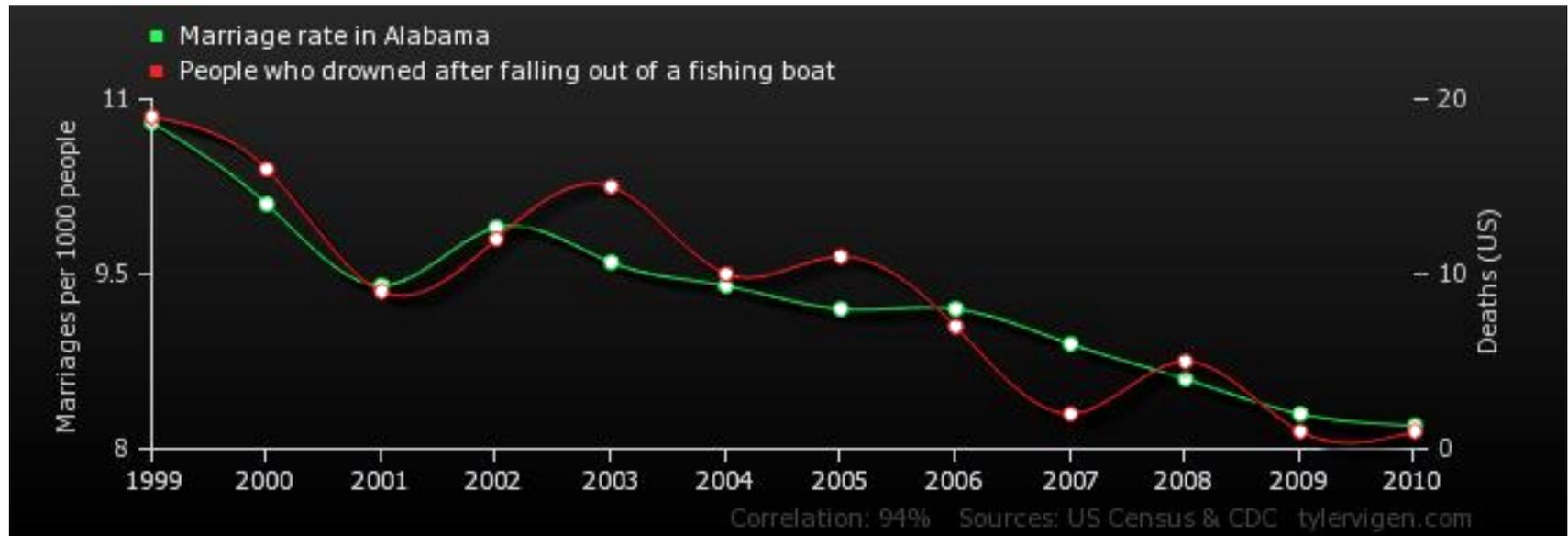
Given a significant positive correlation between self-esteem and reading ability, can we conclude from this:

> *"High self-esteem causes better reading."*

> self-esteem → reading ability

Why not?

- alternative explanations

- directionality problem – maybe the causality is the reverse of what we think

  "Good reading ability causes higher self-esteem."

  reading ability → self-esteem

- third variable problem – when a third variable accounts for the relationship you found between two variables

  "Parental praise causes better reading ability and higher self-esteem."

self-esteem

parental praise

reading ability
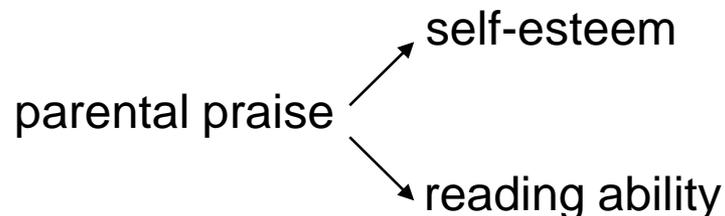
<u>Group Activity</u>

Imagine that a researcher finds that there is a positive correlation between the number of hours of violent TV/video games children watch and their level of aggressive behavior.

The researcher concludes that watching violent TV/video games causes children to act aggressively.

- What other explanation could there be, based on the directionality problem?
- What other explanation could there be, based on the third variable problem? (give a specific possible explanation)

The Experimental Method: Elements of an Experiment

Independent variable (IV) – a variable that is directly changed or manipulated by the researcher

- in order to be an experiment, there must be at least one IV controlled by the researcher

- believed to be the "cause"

Dependent variable (DV) – the measure of behavior that the investigator expects will be affected by the IV

- DV is hypothesized to "depend" on the IV

- believed to be the "effect"

hypothesis for experiment:

" _____ *affects scores on* _____ ."

↑   ↑

IV   DV

Example of an Experiment

- effect of cell phones on driving ability
- participants drive in a driving simulator and the number of driving mistakes they make is counted. Researcher assigns participants to either use a cell phone or not use one while they are driving.
- IV: whether or not they use a cell phone
- DV: driving ability (operational definition: number of driving mistakes)

Example

Diffusion of responsibility experiment

- Is a person less likely to help someone in distress when many other people are around?

- IV = number of other people around
- DV = whether participant helps

Group Activity

- In the following experiments, identify the IV and DV.

1. Will typing performance be worse when there is loud noise occurring than when there is quiet noise?

2. Will more words be remembered if the words are presented visually or auditorally?

Experimental vs. Nonexperimental Methods

- in an experiment, the experimenter must assign the participants to the conditions

- random assignment – the investigator randomly chooses which participants will do which conditions

- Why can't participants choose which condition to be in?

  - Example: testing the effectiveness of an alcoholism treatment program

Experimental vs. Nonexperimental Methods

Method A. Compare people who signed up for a program vs. people who did not sign up for any program
- Do you see any problem with method A?
- people who sign up may be different from those who don't sign up
- this is <u>not an experiment (nonexperimental design)</u>

Method B. Experimenter randomly assigns people with alcoholism to treatment or no treatment
- What is the IV?
- What is the DV?
- this <u>is an experiment</u>

Why is random assignment important?
- it eliminates or minimizes differences between the groups
    - so the only difference between the groups is the IV
    - thus, if the 2 groups have different results, we know it was caused by the IV

Method A: not ideal

before   after

experimental group

treatment

high motivation

control group

no treatment

low motivation

- two differences between the groups: treatment and motivation
- if patients improve, it could be because of treatment or motivation

Method B: better – a real experiment

before   after

experimental group

treatment

control group

no treatment

- if patients improve, it must be because of treatment
- there are no other differences

Does taking daily vitamin C supplements make you get fewer colds?

- Participants will be given vitamin C to take daily or no vitamin C. They will be asked to record when they have colds over the course of 6 months.

    - What is IV?

    - What is DV?

- How should participants be assigned to conditions? Explain how this could be done.

Can we draw a cause-and-effect relationship between the conditions of the study and the results?

- example: In alcoholism study A can we infer that the treatment caused patients to get better? In study B?

- experiments:
  - the researcher manipulates the conditions
  - can infer causality

- nonexperimental methods:
  - the conditions are pre-existing
  - cannot infer causality
  - observe behaviors or relationships so we can describe them

Why in some cases can you not do an experiment?

- practical reasons
  - example 1
    - two prescription drug programs
    - randomly select 25 states to try each
- ethical reasons
  - example 2
    - drug abuse program
    - 50 patients near death
    - room for all 50 in program
    - randomly select half for treatment
    - don't treat the others

- previous research (nonexperimental) had found that women taking postmenopausal hormone replacement therapy had a <u>lower</u> incidence of heart disease
  - compared women already taking hormones or not
- experiment on *effects of postmenopausal hormone replacement therapy* (from Women's Health Initiative)
  - randomly assigned to receive estrogen+progestin or a placebo (sugar pill)
  - women taking hormones had <u>higher</u> incidence of heart disease
- Why the difference in results?

Group Activity

Hypothesis:

stress at work causes family conflict at home

1. How might you investigate this using the experimental method?
2. What are the IV and DV in your experiment?
3. How might you investigate this using a method other than an experiment?
4. Could you determine cause and effect with each of these two methods?
5. Would there be a problem with doing this as an experiment?

Validity

- *validity* – you must be accurately measuring what you say you are measuring
  - how accurate our ideas and our research are
  - degree to which our ideas and research are capable of being supported

- let's say I am inventing a new scale to measure love, which I define as "feeling sexual attraction toward a person and a willingness to make sacrifices for that person" (Mitchell & Jolley, 2007)
  - What questions should I have?

Construct Validity

- *construct validity* – the extent to which a measuring instrument accurately measures the theoretical construct or trait that it is designed to measure
  - does the operational definition actually reflect the true meaning of the construct?
  - does the *MVS Love Scale* actually measure (the construct of) love?

External Validity

- *external validity* – the extent to which the results of a study can be generalized to other people, settings, conditions, and measures
- 'external' – the world outside the setting in which the experiment was performed
- can results be replicated with
  - other operational definitions of the variables
  - different participants
  - other settings?

External Validity

example:

- participants (Intro Psych) take math test with either classical music or no music in background
- result – did better with music
- What are some issues with external validity we should consider?

- *"Can the results be applied to other situations and other people than the ones that were in the study?"*
    - more ability to generalize => greater *external validity*
    - less ability to generalize => less *external validity*

Internal Validity

- *internal validity* – the ability to say that the independent variable caused a difference in the dependent variable
- 'internal' – the experiment itself
- big question:
- "Are there any alternative explanations for the results, other than the IV?"
    - alcoholism treatment study (Method A)
        - we find less alcoholism among treated group than untreated group
        - can't conclude that improvement is due to treatment
        - alternative explanation: could be due to motivation
        - not internally valid
- if we find a difference in the DV between the 2 conditions, can we say for certain that the difference was due to the IV (and not something else)?
- only experiments can have good *internal validity*, because they are the only type of study that can deduce cause-and-effect

Threats to Internal Validity

example: study on effects of crowding on cognitive performance
- the crowded room had a window, and the uncrowded room didn't
- result: crowded group doesn't do as well as uncrowded group
- can the difference in test scores (DV) be attributed to the crowding (IV)?
- alternative explanation: bad scores could be due to looking out the window

Most basic principle in experiments:
- Everything must be the same across conditions except for the independent variable

- *confound (or confounding variable)* – an uncontrolled variable that changes along with the independent variable

Group Activity

Many studies are now done on the internet, and any person in the world can participate.

- What issues with <u>external validity</u> might arise when interpreting the results of such studies?

- Does the fact that it is done on the computer and on the internet make it more *generalizable* or less *generalizable* than traditional research? Give a few reasons why it could be more *generalizable* and a few reasons why it could be less *generalizable*. (adapted from Cozby, 2007)

Group Activity

Jim was doing an experiment on the effect of caffeine on mood. The participants were students coming in to the lab on a winter day. As they came in, Jim gave group A participants a hot cup of coffee. He gave group B participants nothing. Jim found that group A was happier than group B, and concluded that caffeine improves mood.

- What is wrong with this?

- How should this experiment be changed to remedy the problem?

Chapter 4 Terminology

- Confounding Variable
- Construct Validity
- Correlation Coefficient
- Dependent Variable
- Experimental Control
- Experimental Method
- External Validity
- Field Experiment
- Independent Variable
- Internal Validity
- Negative Correlation
- Nonexperimental Method
- Operational Definition
- Participant Variable
- Positive Correlation
- Randomization
- Third-Variable Problem
- Variable