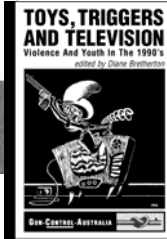
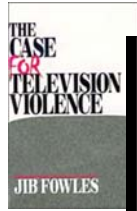


Probabilistic Science



- Correlational Research
- Experimental Research
- Statistics
- Errors and Biases
- Probabilistic Causation

Goals of Psychological Science

Description: Characterize a construct (concept)

Prediction: Identify relationship between two concepts

Explanation: Identify underlying causes of relationship

Control: Alter behavior based on understanding of underlying causes

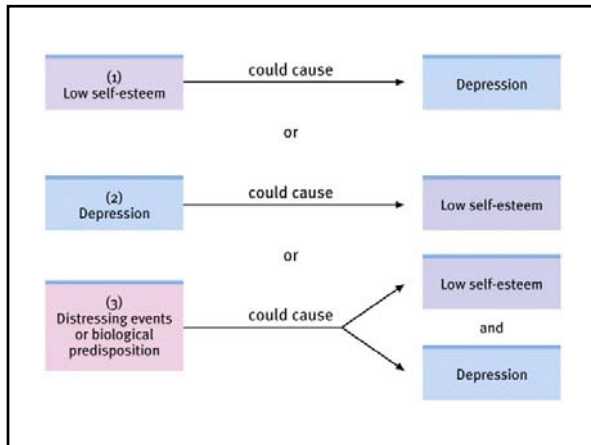
Research Design

Correlational research

Experiments

Correlation or causation?

Problem	Solution
Coincidence	multiple observations comparison group
$X \rightarrow Y$ or $Y \rightarrow X$	temporal priority
$Z \rightarrow X$ and Y	experimentation



Conclusion – Correlational Research

- Always possible for 'unseen' variables to be influencing correlation
- Researcher task:
 - identify plausible alternative explanations
 - Measure alternative variables and show that they can't explain relationships

Experiments

Independent variable (IV)
Dependent variable (DV)

The critical feature of an experiment:
Random Assignment

Example of random assignment

- Does anxiety cause decreased test performance?
 - Correlational – measure anxiety, measure test performance, observe relationship
 - Experimental – induce anxiety in **randomly selected** ½ of participants
-
- IV – anxiety
 - DV – test performance

When to use experiments?


Experiments, with random assignment, are the best method for determining cause-effect relationships, but sometimes:

1. Random assignment is impossible (e.g., sex, race)
2. Random assignment is unethical (e.g., smoking, religion, parental styles)
3. Random assignment is not practical or affordable (Does Oreo eating in childhood cause happiness in old age?)
4. Essential realism cannot be achieved in an experimental setting (predicting marriage)

Error and Bias

Error – random variability in effects (random error)

Bias – non-random, systematic effects caused by a variable that is not part of the research process (systematic error)



Target A (error) Target B (bias) Target C (error and bias)

SAT performance Shoe Size Guess of shoe size by height

Example: Measuring Intelligence

Avoiding Error and Bias

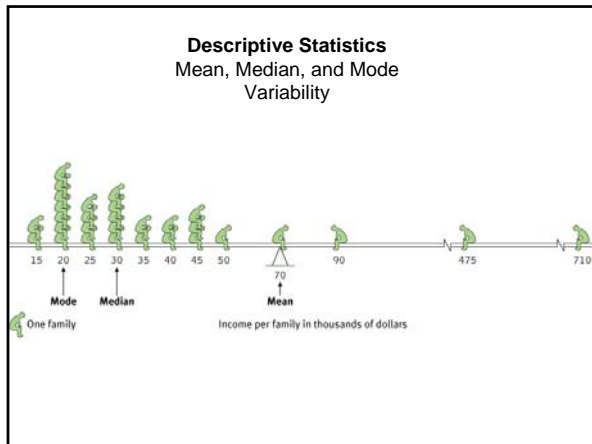
Reliability – consistency of results over time

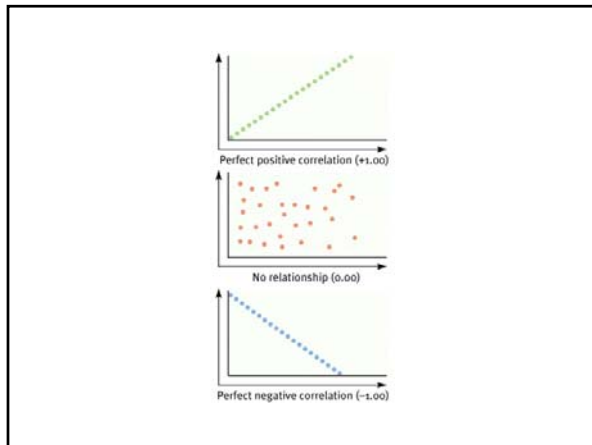
Internal validity

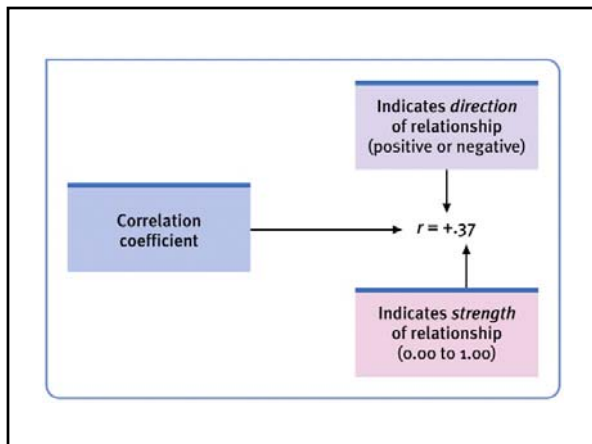
External validity

Random selection

Representative sampling







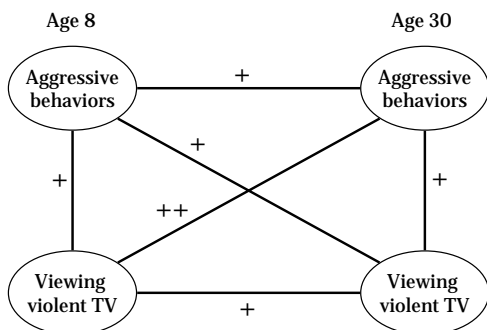
Inferential Statistics

Statistical significance

Probabilistic Causation

- Relations between cause and effect are not perfect, but probabilistic
- Statistical significance tests whether a relationship exists or not; effect size determines the practical significance of the effect
- Examples
 - Smoking causes cancer
 - Television violence causes aggressiveness

Cross-lagged Correlation Design





Experimental Evidence

- 4th and 5th graders
- Karate Kid or scenes from 1984 Olympics
- Watch two 6-year olds over video hookup
- Alert experimenter if they get concerned about kids behavior
- Children exposed to Karate Kid took twice as long to alert experimenter
- Claim: violent images desensitized children to violence

Conclusion – TV and aggression

- Evidence comes in many forms – no one study explains everything
- Violent TV/video games are associated (correlated) with aggressiveness
- Watching violent TV or playing violent video games appears to cause increases in aggressive tendencies and desensitizes viewers to violent acts

Summary



Correlation does not necessarily mean causation
Experiments are the best way to test for causation
Causal factors are probabilistic, not definitive

Next Time: Biological Basis of Behavior
