



## Threats and Experimental Designs

January 28, 2004

How do you think an experiment can be threatened?

How do you think a researcher can solve that class of problems?

### Common Threats to Validity

- Subject Characteristics
- Mortality
- Location
- Instrument
- Maturation
- Regression
- Testing
- History
- Implementation
- Attitude of Subjects

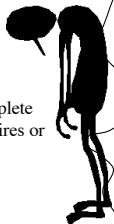
### Subject Characteristics

- Those selected differ from each other in some relevant way
- Age
- Strength
- Maturity
- Gender
- Intelligence
- Manual dexterity
- Attitude
- Just about anything



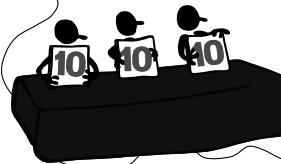
### Mortality (Loss of subjects)

- Some subjects are "lost"
- Most common in experiments over time
- Limits generalizability
- May introduce bias
- Most difficult threat to control
- Reasons
  - Death
  - Moving
  - Don't complete questionnaires or surveys
  - Disinterest



### Location

- Patten calls this "reactive effects of experimental arrangements"
- Classroom
- Labs
- Playgrounds
- Available resources
- Home
- School



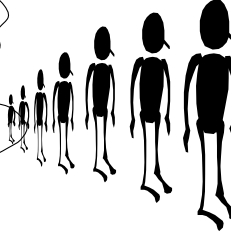
## Instrument

- Poorly designed instrument
- Instrument decay
- Data collector characteristics
- Data collector bias



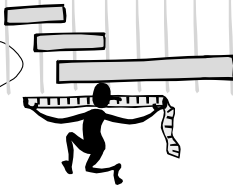
## Maturation

- Changes that naturally come about with time
  - Students grow up
- Best controlled by using a carefully selected comparison group



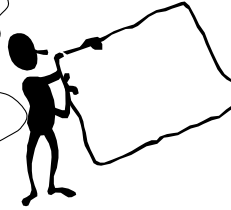
## Regression

- Studies examining those at the ends of the normal curve are most susceptible
- This is based on a statistical term, but means the extremes often don't stay quite as extreme



## Testing

- The “practice” effect of testing shows up in the results
- Subjects learn what will be tested
- Subjects may “figure out” what the researcher is really after



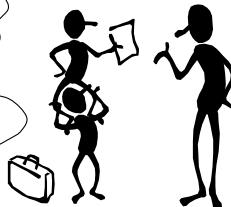
## History

- The effect of an unanticipated event on the results
- Examples
  - Fire alarm going off during test
  - Traumatic event right before or during the test




## Implementation

- Comes from those assigned to implement a study
  - May differ in ways that are relevant
  - May have a bias in favor of one way or another



## Attitude of subjects



- Sometimes called the “Hawthorne Effect”
  - Subjects respond because there is a change
- Control group can be effected by the lack of attention

Threat	Standardize Conditions	Obtain more info on Subjects	Obtain more info on Details	Choose Appropriate Design
Subject characteristics		X		X
Mortality		X		X
Location	X		X	X
Instrumentation	X		X	X
Testing				X
History			X	X
Maturation		X		X
Subject attitude	X		X	X
Regression		X		X
Implementation	X		X	X

## Experimental Designs

- “True” experimental designs
  - Researcher makes own groups using randomization
  - Often administers a pre-test to determine baseline condition

Group 1 R O X O      Prone to testing threat  
 Group 2 R O O

Group 1 R X O      No longer prone to testing threat, but might not know the baseline  
 Group 2 R O

## Combining best of both

Group 1 R O X O  
 Group 2 R O O  
 Group 3 R X O  
 Group 4 R O

Solomon randomized 4 group design