Experiments

EXPERIMENTS

- **Best way to Determine What Causes What**
  - Cause-Effect relationships
  - The power lies in causality
- **Definition:**
  - "is a research method where the independent variable is manipulated and its effects on the dependent variable(s) are observed" (p.217)
  - Assumptions: the change in the independent variable caused the effect in the dependent variable
  - Labels: controlled experiment; scientific study

EXPERIMENTS

- **Remember: The Independent Variable:**
  - **It causes an effect in the dependent variable**
  - Also called: the stimulus or manipulated variable or the treatment.

Experimental Designs

- General Design:
  - **Test someone (pre-testing the dependent variable)**
  - **Expose him to stimulus (independent var)**
  - **Test him again to see if anything changed (post testing the dependent var)**

Experimental Designs

- Hypotheses are important here, since experiments are more formal and follow strict rules compared to other methods

- **Example For This Session:**
  - **RQ: Do negative political ads cause voters to favor a certain candidate?**
    - **H1: Voters who watch anti-Hilary Clinton ads are more likely to favor Barack Obama.**
    - **H2: Voters who watch anti-Barack Obama ads are more likely to favor Hilary Clinton.**
    - **H3, H4…**

Experimental Designs

- **The Treatment or Experimental Group**
  - This is the group exposed to the stimulus (independent variable)
  - It is designated by the symbol **X**

- **The Control Group**
  - This group is not exposed to the stimulus (placebo or sugar pill)
  - Allows one to determine if other things are influencing the experiment ("Hawthorne effect")
  - Reduces threats to Internal validity
  - It is designated by the symbol **C**

Experimental Designs

- **Random assignment**
  - Different from random sampling!!
  - Used to insure groups are equal or comparable
  - If random assignment used, then posttest only is OK (no need for pre-test)
  - Reduces threats to both internal and external validity
  - Indicated by the Symbol **R**

Experimental Designs

- **Experimental Symbols**
  - X: independent variable (experimental group)
  - O: dependent variable (pre-test/post-test)
  - C: Control Group (symbol not the in book)
  - R: Random assignment (not random sample)
- Example for reading symbols:
  - O – X – O:
    - **experimental group w/ 1 pretest & 1 post-test.**
  - O – C – O:
    - **control group w/ 1 pretest & 1 post-test.**
  - R O – X – O:
    - **Random assignment for exper. Group w/…**
  - – X – O
    - **Experimental group w/ 1 post-test only.**

Experimental Designs

- **Four Designs: (p. 220)**
  - One group pretest-posttest
  - Pretest-posttest with control group
  - Solomon four group design
  - Posttest only control group
  - Plus random assignment

Experimental Designs

- **Four Designs: (Fig 12.3 p. 220)**
  - One group pretest-posttest
    weak, inexpensive, easy
    O – X – O
  - Pretest-posttest with control group
    strong, medium expense, time, difficulty
    O – X – O
    O – C – O

Experimental Designs

- **Four Designs: (Fig 12.3 p. 220)**
  - Posttest only control group
    strong, medium expense, time, difficulty (if w/ Random assignment)
    – X – O
    – C – O
  - Pretest-posttest with *control group* & *Random Assignment*
    R – X – O
    R – C – O
    (Here you can also have random sampling)

Experimental Designs

- **Four Designs: (Fig 12.3 p. 220)**
  - Solomon four group design
    'strongest', expensive, time-consuming, hard
    O – X – O
    O – C – O
    – X – O
    – C – O

EXPERIMENTS

- **Experimental Concepts, Designs, and Symbols**
  - Experimental Validity
    - Internal validity: did the independent variable actually cause a change in the dependent variable?
    - External validity: can the results be generalized to a larger population (the target population)
    - Good design is key!

Threats to Internal Validity

- **Here are seven** *(p.222)*
  - **History** – any external event that occurs between pretest and post-test
    - external events
    - ex: 9/11 occurred in the middle of the experiment
  - **Maturation** – any changes that occur in the subjects between pretest and posttest
    - internal changes
    - ex: Exposure to a piece of knowledge

Threats to Internal Validity

- **Here are seven** *(p.222)*
  - **Testing** – any pretests that many affect the values of the posttest
    - ex: Pretest was an IQ tests, Post-test was IQ test
  - **Instrumentation** – changing the instrument between pretest and posttest
    - ex: Pretest was blood test for alcohol, Post-test was breath test for alcohol

Threats to Internal Validity

- **Here are seven** *(p.222)*
  - **Statistical regression** – selection of subjects based on extreme scores – the posttest scores tend to become less extreme or tend to regress towards the mean
    - ex: most participants scored between 70-75 except for two who scored 100 and 30 respectively

Threats to Internal Validity

- **Here are seven** *(p.222)*
  - **Differential selection of subjects (selection)** – when the experimental group and control group differ significantly
    - ex: Experimental group is males, control group is females
  - **Mortality** – when subjects who drop out between pretest and posttest are not equal in experimental and control group
    - ex: Five dropped out of experimental group while none from control group

Threats to Internal Validity

- **Offsetting internal threats to validity:**
  - Random Assignment + Control Group
  - Also time, place, instrument, consistency…
  - If no random assignment, match according to key characteristics
  - Equal number of subjects in groups

Threats to External Validity

- **Here are three:**
  - **Pre-testing:** usually can not generalize beyond experimental group
  - **Selection:** can not be generalized if subjects don't represent the universe
  - **Setting**: lab environments are different from real life environments.

Threats to External Validity

- **Offsetting external threats to validity**
  - Random Sampling and Random assignment
  - Avoid pre-testing or include both pre-testing and no pre-testing in the design
  - Emulate the natural setting but not to the point that will threaten internal validity – you need a certain level of control

The Hypothetical Experiment's Design

- **Measuring/administering the Independent Variable**
  - Find an effective way to expose the experimental groups to the treatment.
  - Consistency is key.
- **Measuring the Dependent Variable**
  - Questionnaire, observation, behaviors, etc…
  - Try not to make the purpose of the study too obvious to the subjects

The Hypothetical Experiment's Design

- **Experimental participants**
  - The better they match the target population, the better for external validity (generalization of results)
- **Experimental Setting**
  - Laboratory: better internal, worse external validity
  - Field: better external, worse internal validity

Execution of the Experiment

- **Practice Run Precedes the Actual Experiment**
  - Fix any problems
  - Time it out
  - Run initial statistics
  - See if the experimental group noticed the stimulus

Execution of the Experiment

- **Ethical Standards!**
  - Very important since you may have to conceal the true design of the experiment at first
  - Do not cause harm
  - Treat them with respect
  - Confidentiality and anonymity

Data Analysis Continued

- **Correlation:**

Correlations

		Is life exciting or dull?	Highest year of school completed
Is life exciting or dull?	Pearson Correlation	1	-.205**
	Sig. (2-tailed)	.	.000
	N	992	991
Highest year of school completed	Pearson Correlation	-.205**	1
	Sig. (2-tailed)	.000	.
	N	991	999

**. Correlation is significant at the 0.01 level (2-tailed).

Data Analysis Continued

- **Correlation:**

			in
Il g	P	1	8
b	S	.	
	N	9	9
b	R	8	1
	S	0	.
	N	9	9

*. C r

Data Analysis Continued

- **The t-Test**
  - Determines if two means are significantly different

t-Test

		F		t						
				8	7		3		2	2

Data Analysis Continued

- **Analysis of Variance (ANOVA)**
  - Same as a T-Test but for multiple independent variables (multiple effects)

				F	
		7			
		1			
A		3		0	
B		1			
		3			