Research Methods in Psychology

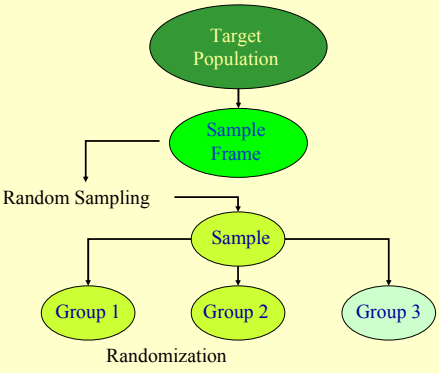
Experimental Design, Part 2

What We Will Cover in This Section

- Overview.
- Basic requirements.
- Between subjects designs.
- Within subjects designs.
- Factorial designs.
- Pre-experimental designs.

Basic Requirements, Review

- Two or more groups.
- Participants randomly assigned to treatment conditions.
- One or more treatment conditions.



Basic Design

Treatment Groups	Independent Variable	Dependent Variable
Group 1	Treatment (s) controlled by the experimenter	Measurement(s) made after the treatments are applied.
Group 2		

Treatment Groups

Experimental Group

Group that gets some level of the treatment being studied.

Control Group

Group in the study that does not get the experimental treatment.

Comparison Group

Group in the study that gets some alternative level of the experimental treatment.

Characteristics of Good Treatments

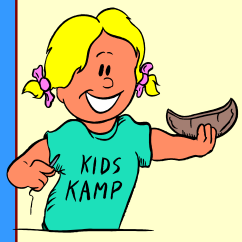
- Valid.
- Strength
  - Right levels.
  - Right strength.
  - Salient.
- Reliable.
- Multiple levels.
- Multiple stimuli.

Field Research Example

- In 1984 Pittsburgh National Bank had a problem with their tuition reimbursement program.
- They were paying tuition and fees for employees seeking bachelors degrees.
- Approximately 45% of the people did not want to work in the field in which they majored.
- The bank was prepared to scrap the program.

Evaluation Design

	Independent Variable	Dependent Variable
Experimental Group	342 people who attended workshop	Job posting Applications 70% Promotions: 12% Salary/grade change: 91%
Control Group	450 people who did not attend the workshop.	Job posting Applications 23% Promotions: 3% Salary/grade change: 66%



Between Subjects Designs

Basic Elements

- Two or more treatment conditions.
- Subjects exposed to only one treatment condition and one treatment level.

Randomized Post-test Only Control Group

	Independent Variable	Dependent Variable
SS_1 SS_2 SS_3	Treatment 1	Measure
SS_4 SS_5 SS_6	Treatment 2	Measure

Randomized Pre-test Post-test Control Group

	Pre-test	Independent Variable	Post-test
SS_1 SS_2 SS_3	Measure A	Treatment 1	Measure A
SS_4 SS_5 SS_6	Measure A	Treatment 2	Measure A

Pre-test, Post-test

Benefits.

1. Evaluate the assumption that the groups are alike.
2. Look at the extent of change.
3. Evaluate the influence of participant mortality.

Issues.

1. Takes time.
2. Demand characteristics.
3. Carry over effect.
4. Testing reactivity.
5. History.

Matched Random Assignment

	Independent Variable	Post-test
SS_{1A} SS_{2B} SS_{3C}	Treatment 1	Measure A
SS_{4A} SS_{5B} SS_{6C}	Treatment 2	Measure A

Matched Random Assignment

- Group 1
  - S1. Smartest
  - S2. 4th Smartest
  - S3. 5th Smartest
  - .
  - .
  - .
- Group 2
  - S1. 2nd Smartest
  - S2. 3rd Smartest
  - S3. 6th Smartest
  - .
  - .
  - .

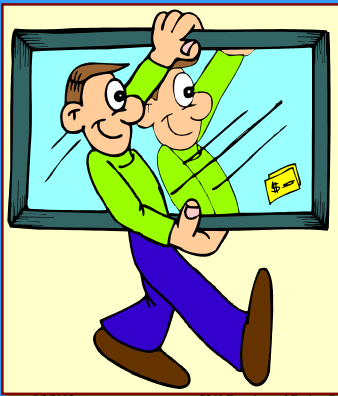
Matched Random Assignment

Benefits

1. Minimizes probability that groups will be different on a key variable.
2. Reduces random subject error.

Issues.

1. Time consuming.
2. Never sure you have controlled for all variables.
3. Complicated with multiple variables.



Within Subjects Designs

Within Subjects Design

	Independent Variable	Post-test
SS_1 SS_2 SS_3	Treatment 1	Measure A
SS_1 SS_2 SS_3	Treatment 2	Measure A
SS_1 SS_2 SS_3	Treatment 2	Measure A

Example

	Independent Variable	Post-test
SS_1 SS_2 SS_3	Milk Chocolate	Preference
SS_1 SS_2 SS_3	German Chocolate	Preference
SS_1 SS_2 SS_3	Dark Chocolate	Preference

Question

What is a potential problem with this design?

Benefits and Issues

Benefits.

1. Fewer participants.
2. Reduce subject variability.

Order effects.

1. Practice effect.
2. Fatigue effect.
3. Carryover effect.
4. Sensitization effect (demand characteristics).

Counterbalancing

- Varying the order of the presentation of the independent variable.
- Full counterbalancing.
  - Issue here is the number of possibilities is N!.
- Randomized blocks.

Counterbalancing

	Trial 1	Trial 2	Trial 3
S1	Milk Chocolate	German Chocolate	Dark Chocolate
S2	Dark Chocolate	Milk Chocolate	German Chocolate
S3	German Chocolate	Dark Chocolate	Milk Chocolate

Multiple Variable (Factorial) Designs

Factorial Design

A design in which participants are exposed to two or more treatments.

Outcomes

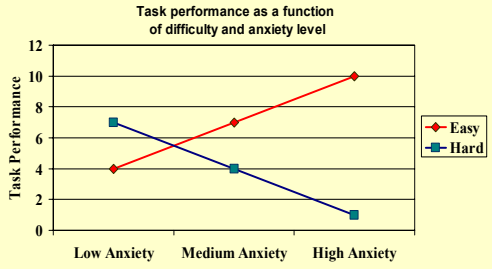
Main Effect

The influence that one variable alone has independently of the other variables.

Interaction

The influence that two or more variables together have on the dependent variable over and above their main effects.

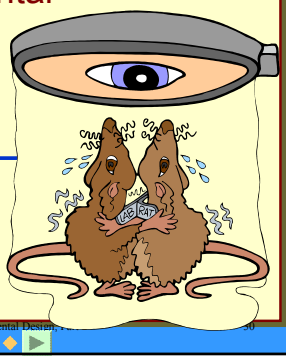
Example



Uses of Factorial Designs

1. Testing for moderator effects.
2. Are there order effects.
3. Controlling extraneous variables.

Pre-Experimental And Quasi-Experimental Designs



Ex Post Facto Approach

	Independent Variable	Dependent Variable
Group 1	Groups divided based on some pre-existing condition.	Measurement(s) made after the assignment to groups.
Group 2		

Example

An experimenter wanted to see if more women than men were whistle blowers in industry. The researcher looked though fifty business journals and magazines and tabulated the gender of the whistle blowers for the past ten years.

Benefits and Issues

Benefits.

1. May be the only way to study some influences.
2. May be OK for preliminary research.

Issues.

1. Ss not randomly assigned to treatment conditions.
2. If a person is unusual on one characteristic he may be unusual on others.

Threats to Internal Validity

1. History.
2. Maturation.
3. Testing.
4. Instrument Decay.
5. Statistical Regression.

1. History

Any event that occurs between the first and second dependent measures that is not manipulated by the experimenter.

Pre-test	Treatment	Post-test

Treatment	Delay	Post-test

2. Testing

Participation in the pre-test may cause changes in the person.

- Reactivity
- Memory

Pre-test	Treatment	Post-test
	Treatment	Post-test
Pre-test	Delay	Post-test

3. Maturation

Changes in the individual over time that are not associated with the independent variable.

Treatment	Delay	Post-test
Placebo	Delay	Post-test

4. Instrument Decay

Changes in the measuring instrument over time.

- Observer gets bored.
- Test becomes obsolete.
- Machine wears out.

Pre-test	Treatment	Post-test
	Treatment	Post-test

5. Statistical Regression

Occurs when participants are placed into groups based on extreme scores. Extreme scores tend to move(regress) toward the mean.

Pre-test	Treatment	Post-test
Pre-test	Delay	Post-test

One-Shot Case Study

	Independent Variable	Dependent Variable
Group	Treatment (s) controlled by the experimenter	Measurement(s) made after the treatments are applied.

What problems are there with this design?

Benefits and Issues

Benefits.

1. OK for preliminary research.

Issues.

1. Compared to whom?

One-group Pre-test Post-test

	Pre-test	Independent Variable	Post-test
Group	Measure A	Treatment 1	Measure A

What problems are there with this design?

Benefits and Issues

Benefits.

1. OK for preliminary research.

Issues.

1. History.
2. Maturation.
3. Testing.
4. Instrument decay.

Non-equivalent Control Group

	Independent Variable	Dependent Variable
Group A	Treatment 1	Measure
Group X	Treatment 2	Measure

What problems are there with this design?

Benefits and Issues

Benefits.

1. May be the only alternative in field experimentation.

Issues.

1. Treatment difference is CONFOUNDED by group difference.

Thought Problem #1

Patty Kayke decided to evaluate the effects of low-level sound tone on the sleeping behavior of dogs. She took a group of dogs and through a set of hidden speakers played a 200 Hz sound to the dogs at 20 decibels. She then evaluated their sleeping behavior.

1. **What kind of design is this?**
2. **Is this a good or bad design? Why?**
3. **How could this study be improved?**

Thought Problem #2

Justa Minnit decided to evaluate the effect of taking one long versus several short breaks on the learning level of his class. Justa took the Tuesday class and had them take one 15 minute break. For the Wednesday class Justa have the students three 5 minute breaks. Justa then gave both classes the same quiz to measure learning.

1. **What kind of design is this?**
2. **Is this a good or bad design? Why?**
3. **How could this study be improved?**

Thought Problem #3

Pickup N. Dropoff wanted to evaluate the influence of Jolt on the driving habits. Dropoff had a group of people drink 12 oz of Jolt, then assessed their ability to drive through a set of traffic cones. Dropoff then waited an hour and had the people drive through the cones again. He evaluated the differences number of cones hit.

1. **What kind of design is this?**
2. **Is this a good or bad design? Why?**
3. **How could this study be improved?**

Thought Problem #4

Petal D. Stamen was interested in the influence that flowers would have on women's affection toward men. Petal sent a dozen roses to a random sample of women then asked them to fill out a well researched affection survey.

1. **What kind of design is this?**
2. **Is this a good or bad design? Why?**
3. **How could this study be improved?**