

Research Methods Part III: Lecture 17

Single-factor two-level design

Outline

- Experimental vs. Control groups
- Factor vs. Level
- Single-factor, two-level designs
 - independent groups
 - matched groups
 - nonequivalent groups
 - repeated measures
- Solomon's 4 group design

Experimental vs. Control Groups

- Experimental group – a group that receives treatment
- Control group
 - any group selected for comparison with the experimental group
 - no treatment group
 - ideal control group – identical to the experimental group on all variables except independent variables

Classifications of Control Groups

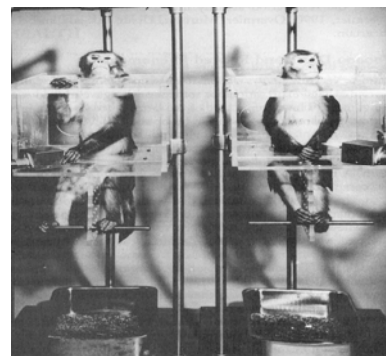
- Straight control groups
 - Untreated, typical control groups
- Placebo (“I shall please”) control groups
 - to control placebo effect
 - placebo effect – simply receiving any treatment makes people feel better
 - commonly used in research on drug effects

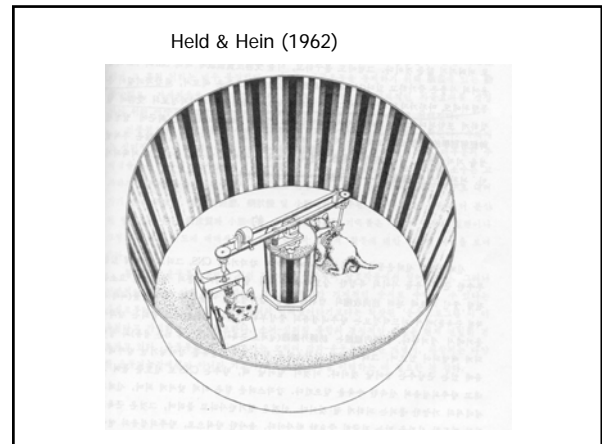
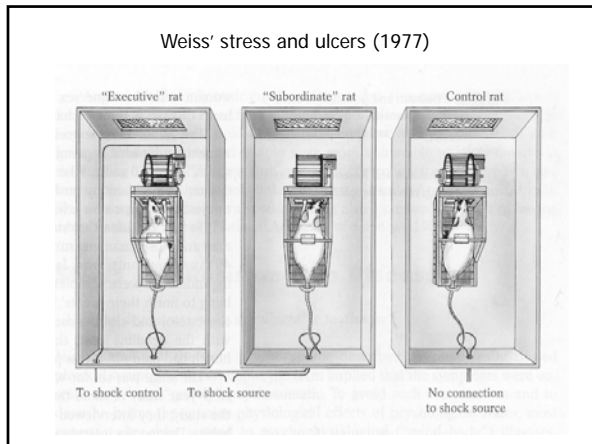
Experimental
Placebo control
Straight control

Classifications of Control Groups

- Yoked control groups
 - each member of the control group is matched or “yoked” to a member of the experimental group for precise control
 - e.g., Brady (1958)
Weiss (1977)
Hein & Held (1962)

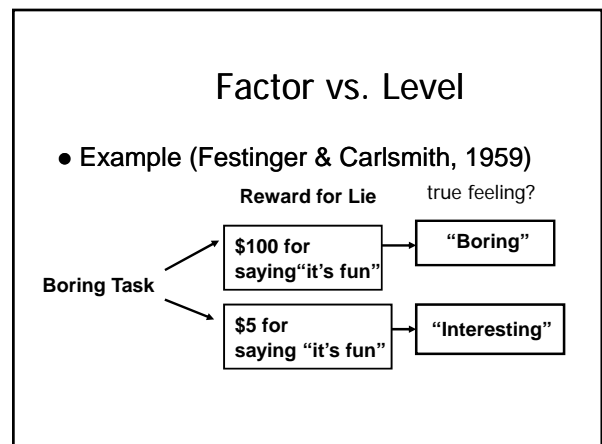
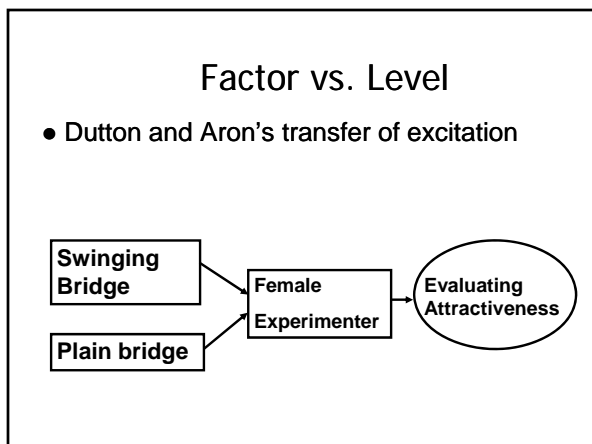
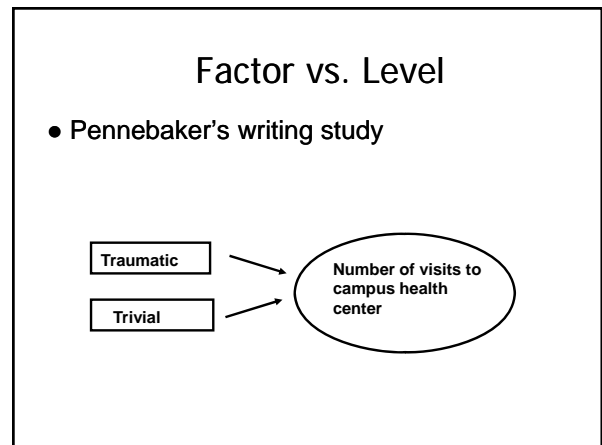
Brady's stress and ulcers (1958)





Factor vs. Level

- factor – independent variable
- level – refers to the value, amount, or kind of the independent variable

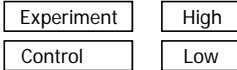


Single-factor, two-level designs

- Simplest experimental designs

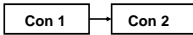
- between-subjects

- independent groups
- matched groups
- nonequivalent groups (natural groups)

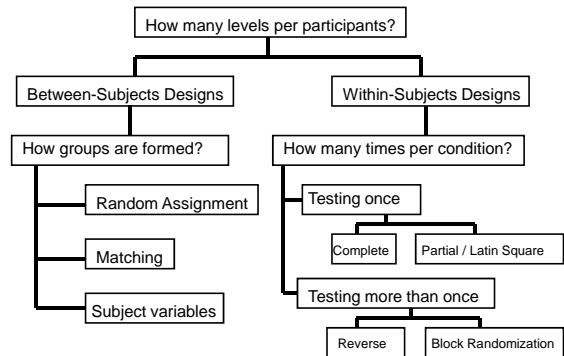


- Within-subjects

- Repeated measures

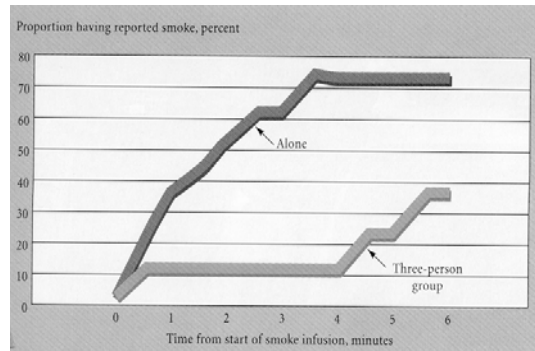
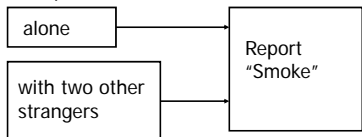


Flowchart for identifying experimental designs



Independent group designs

- Form two groups by random assignment
- e. g., "Smoke study" (Darley & Latané, 1970)

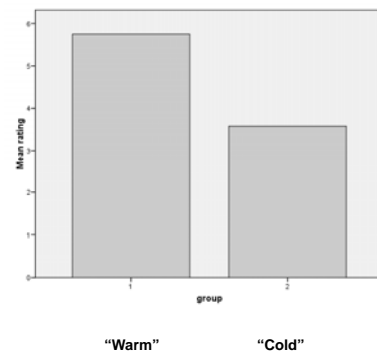


e.g., Impression formation study (Asch, 1946)

Please imagine a hypothetical person characterized by the traits in the below. Read the traits carefully and form an impression of this person.

- | | |
|----------------|----------------|
| • List #1 | • List #2 |
| • intelligence | • intelligence |
| • skillful | • skillful |
| • industrious | • industrious |
| • warm | • cold |
| • determined | • determined |
| • practical | • practical |
| • cautious | • cautious |

How much do you think that you will like this person?

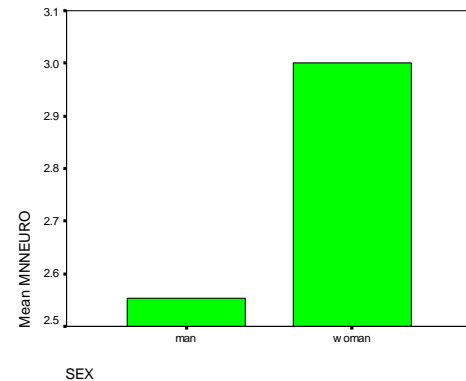


Nonequivalent group designs

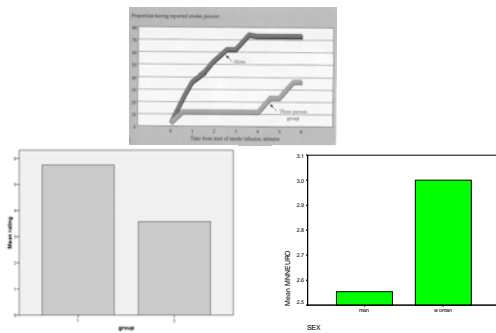
- form two groups based on a subject variable
- e.g., gender and neuroticism

Group Statistics

	SEX	N	Mean	Std. Deviation	Std. Error Mean
MNNEURO	man	7	2.55	.269	.102
	woman	18	3.00	.963	.227



How to analyze data from Independent and Nonequivalent groups designs?



t-test

- William S. Gosset (1876-1937)
- Beer brewery and statistics

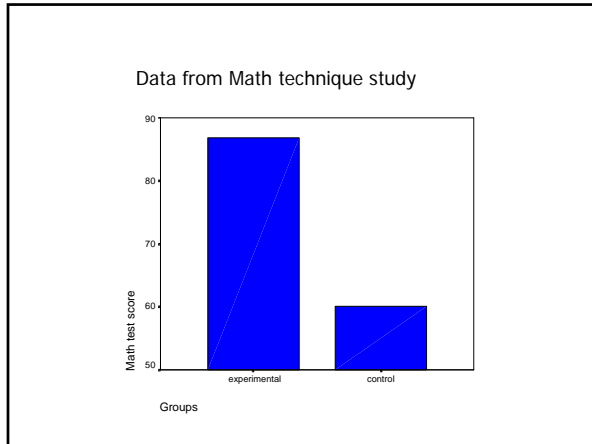


t-test for independent groups

- what is this statistic for?
 - evaluates the size of the difference between the means of *two groups*

Matched group designs

- with a small sample or to control some major confounding variables
- Matching → random assignment
- e.g., new teaching technique for math
 - control math ability (math SAT scores)
- e.g., twins, husband & wife, parent & children



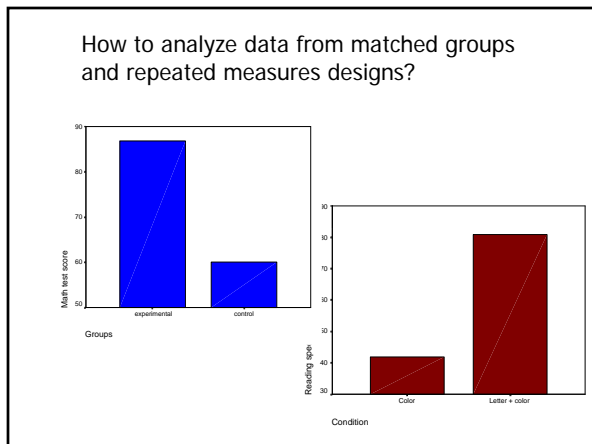
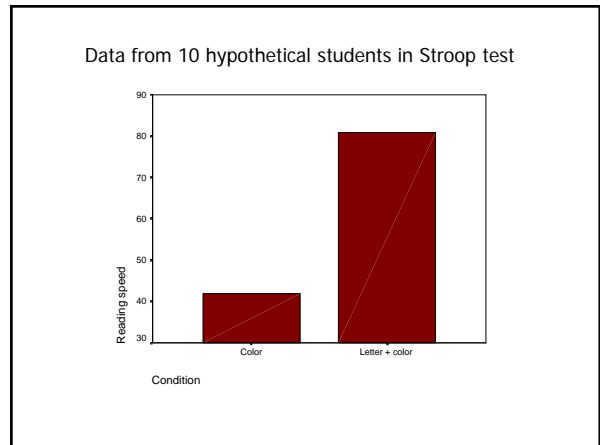
Repeated measure designs

- e.g., Harry Harlow (1959)

"Wire Mother" "Terrycloth Mother"

Repeated measure designs

- e.g., stroop test



t-test for dependent groups

- what is this statistic for?
 - evaluates the size of the difference between the two means from *one group (or matched group)*

Summary of single-factor designs

	minimum levels of IV	between or within?	Types of IV	Statistical analysis
Independent groups	2	between	manipulated	t-test for independent groups
Matched groups	2	between	manipulated	t-test for dependent groups
Nonequivalent groups	2	between	subject	t-test for independent groups
Repeated measures	2	within	manipulated	t-test for dependent groups

Single-factor, two level, between-subjects designs

- posttest only, control group designs

experimental: X O₂
control: O₂

- pre-posttest, control group designs

experimental: O₁ X O₂
control: O₁ O₂

Single-factor, two level, between-subjects designs

- pre-posttest, control group designs
 - When it is used?
 - to check the equivalence of experimental and control groups
 - to evaluate the change before and after treatment

Single-factor, two level, between-subjects designs

- pre-posttest, control group designs
 - Possible disadvantages:
 - pretest sensitization – the pretest might interact with the treatment
 - e.g., effect of test anxiety program

experimental: Testing1 Program Testing2
control: Testing1 Testing2

Single-factor, two level, between-subjects designs

- How to control? – Solomon's 4 group design

Experimental 1 O₁ X O₂
Experimental 2 X O₂
Control1 O₁ O₂
Control2 O₂

Solomon's 4 group design

Ideal result

Experimental 1	O ₁ 90	X	O ₂ 70
Experimental 2		X	O ₂ 70
Control1	O ₁ 90		O ₂ 90
Control2			O ₂ 90

Solomon's 4 group design

Pretest sensitization

Experimental 1	O ₁ 90	X	O ₂ 70
Experimental 2		X	O ₂ 90
Control1	O ₁ 90		O ₂ 70
Control2			O ₂ 90

Solomon's 4 group design

- Disadvantages:
 - too expensive