

# Mixed Factorial Designs

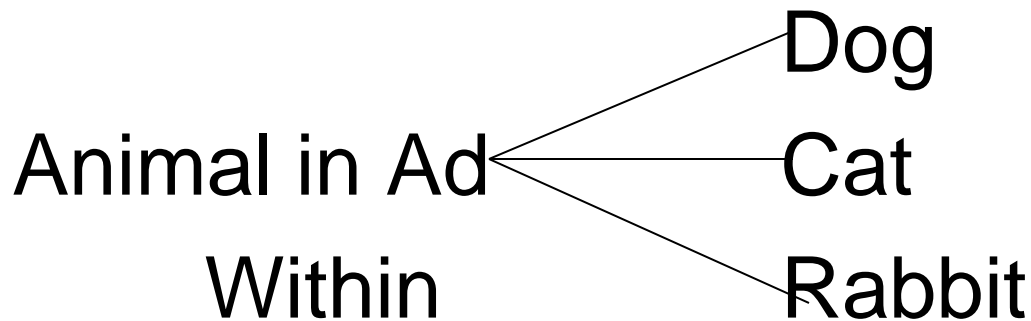
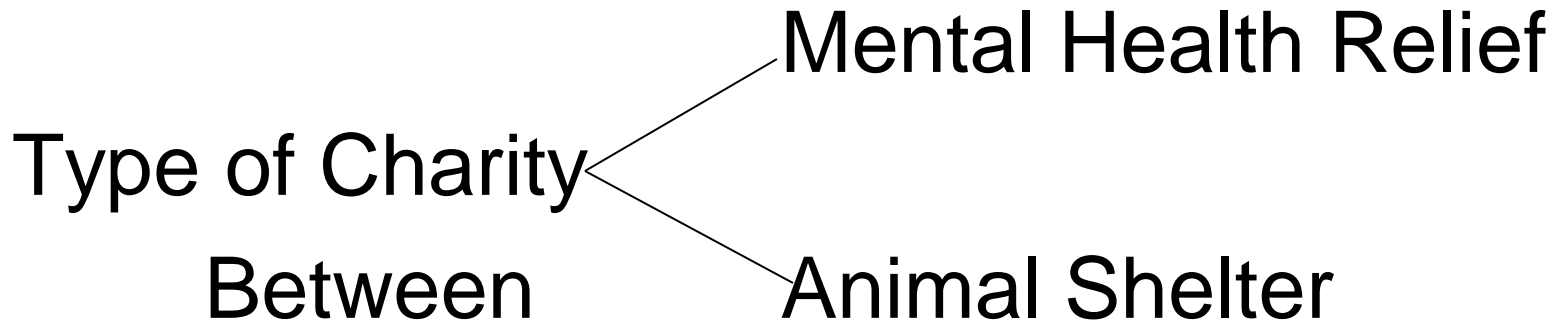
Factorial Design—2 (or more) IV's

Repeated measure on one Indep. Variable

Between groups measure on the other

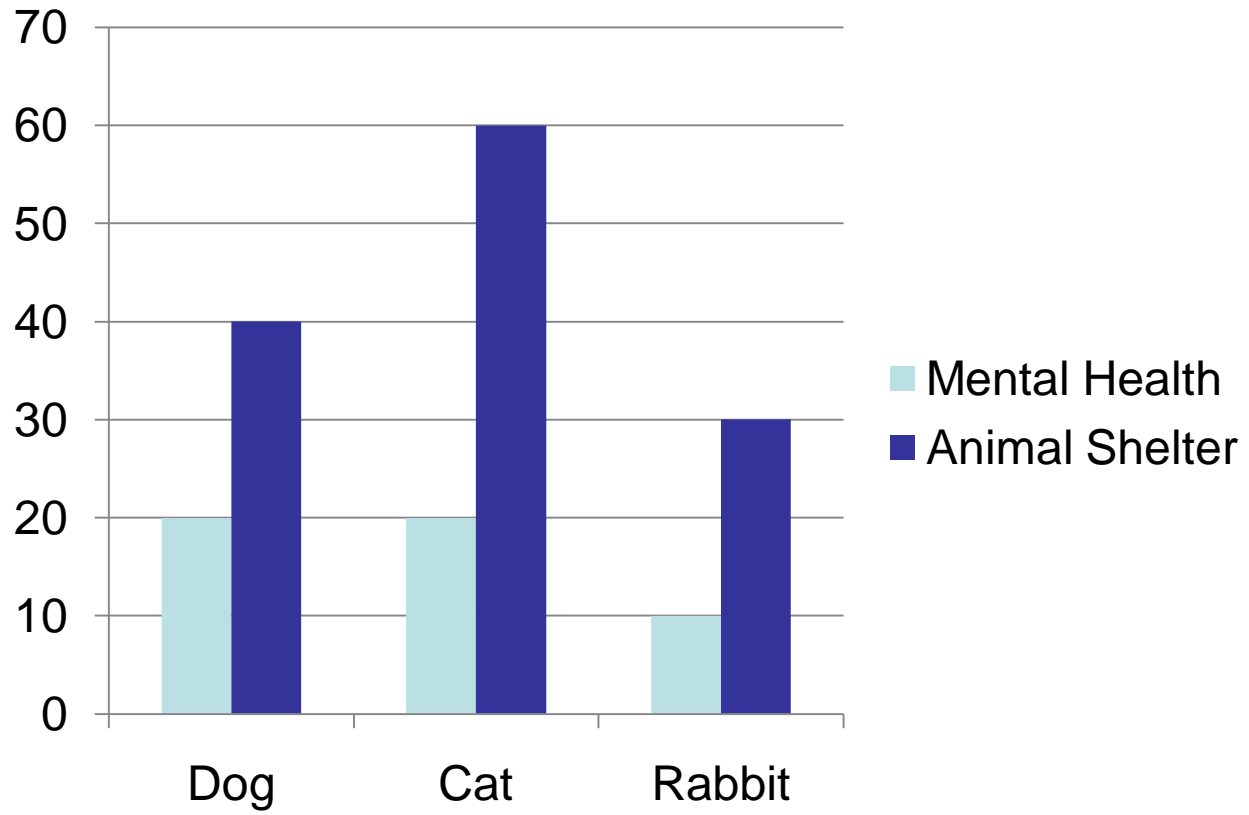
Question: How to get people to contribute more to charity event?

# Two Independent Variables



# How much (\$) would you give? (Graph the means)

	Dog	Cat	Rabbit
Mental Health	20	20	10
Animal Shelter	40	60	30



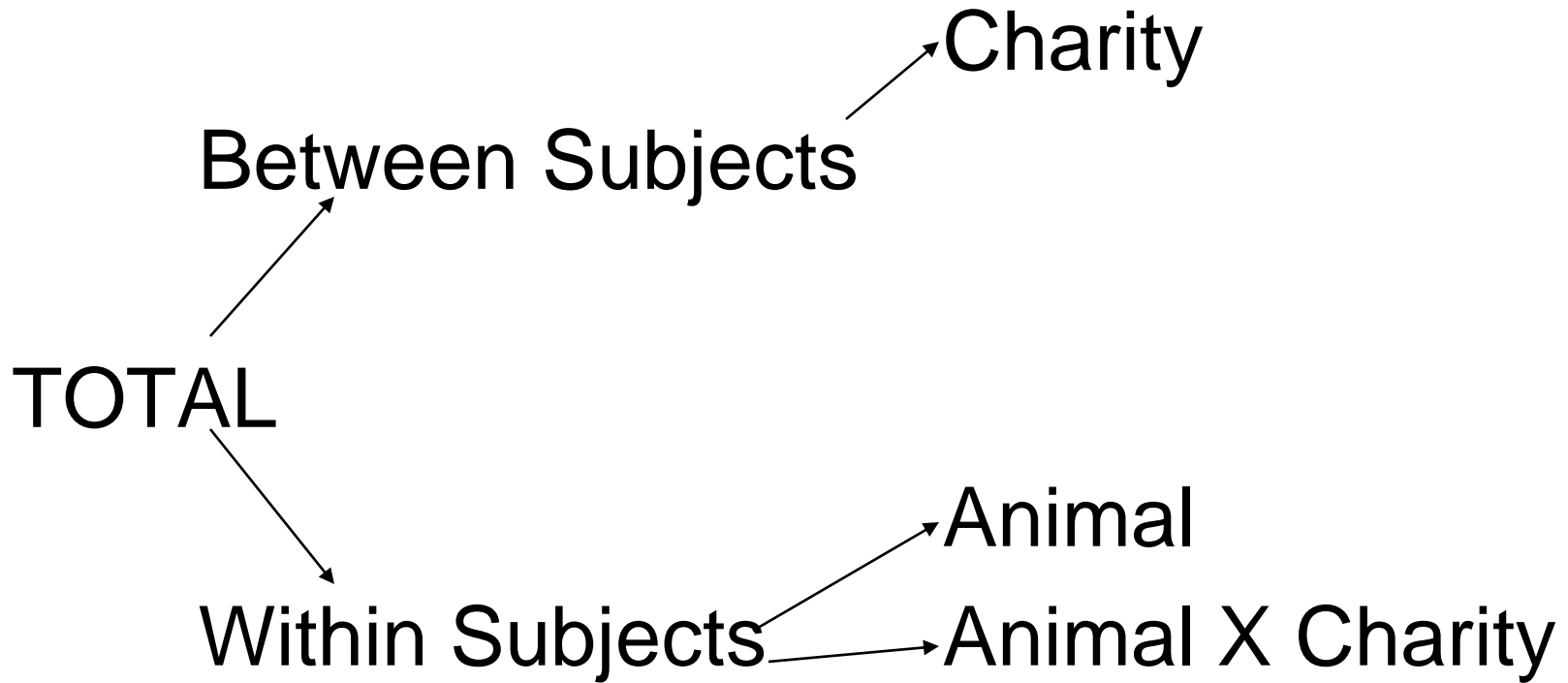
# Partitioning the Variance

Finding the F ratios that are important  
a little difficult

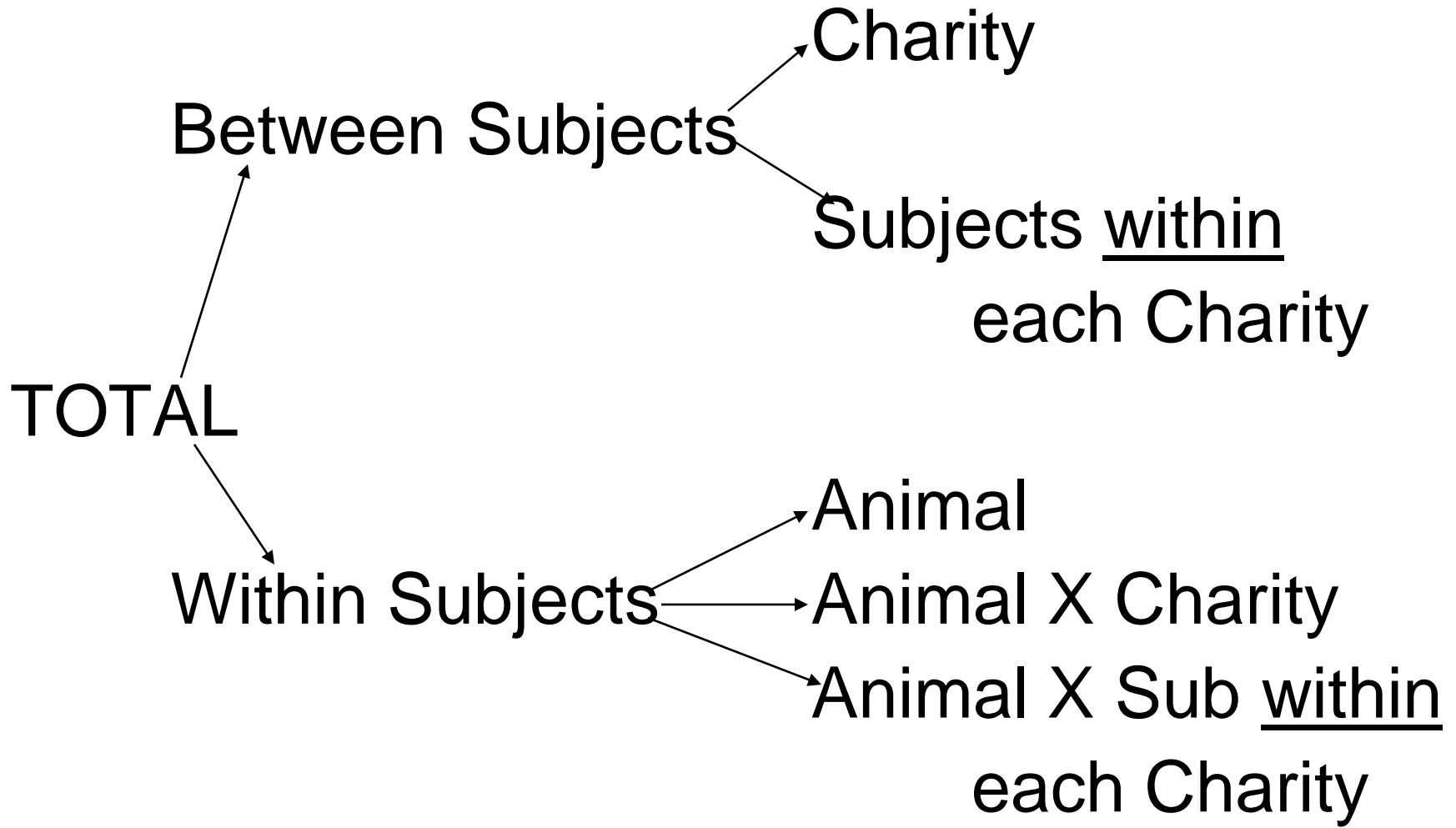
F's that you want are

- 1) Main Effect for Type of Charity  
(Between Groups)
- 2) Main Effect for Type of Animal
- 3) Interaction of Charity X Animal  
(Both Within Groups)

# F-Ratios (divide each by own term)



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# Degrees of Freedom calculation

Also a little tricky

Between Subjects:

$$[\text{Charity (2)} \times \# \text{ Subjects in each charity (10)}] - 1 = 19$$

$$\text{Charity: } [\text{Charity (2)} - 1] = 1$$

Subjects w/in each gp:

$$[\text{Charity (2)} \times (\# \text{ S's each gp} - 1)] = 18$$

Note: df's for Charity & S's within each gp add up to the df's

$$\text{Between Subjects } (1 + 18 = 19)$$

Within Subjects Next

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Within Subjects Next

# Degrees of Freedom calculation

Within Subjects:

$$[\text{Charity (2)} \times \text{\#S's in each Charity (10)}] \times [\text{Animals (3)} - 1] = 40$$

$$\text{Animals } [\text{Animals} - 1] = 2$$

$$\text{Animals} \times \text{Charity } [A - 1] \times [C - 1] = 2$$

Charity X Subjects Within Groups

$$[\text{Charity} \times (A - 1) \times (\text{\# S's/gp} - 1)] \\ 2 \times 2 \times 9 = 36$$

Note that all the “Within Subject” terms add up to the total df for  
Within Subjects  $2 + 2 + 36 = 40$

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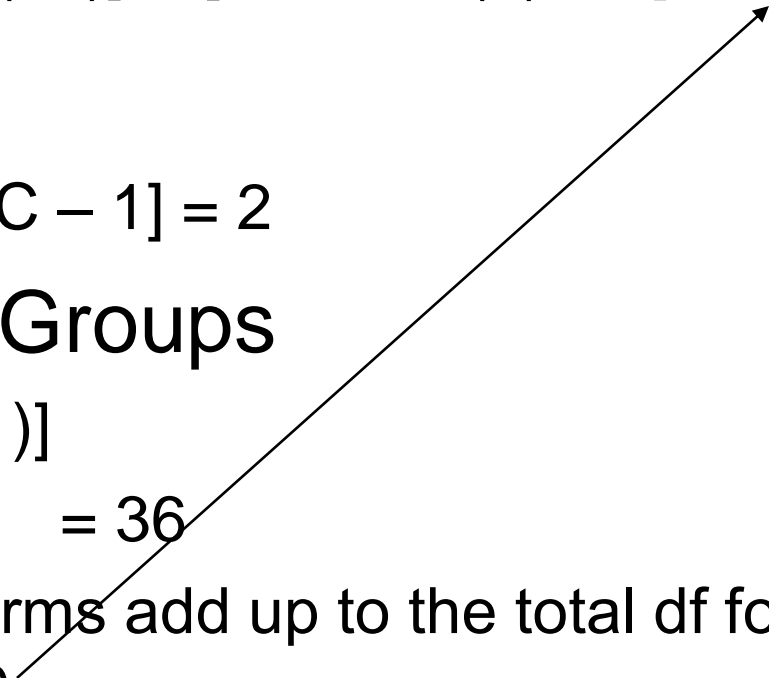
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Within Subjects  $2 + 2 + 36 = 40$



# Mixed Factorial Design

Some Variables can be Repeated Measured while others are between groups

The difficult part is knowing which term is correct for the F ratio.

Computer program may do the analysis for you, but you need to know which variables are within versus between

Several Variations on this design

MANOVA, ANCOVA

# MANOVA

Suppose in the “Charity” study we had several dependent measures:

- 1) Money they would contribute
- 2) How much money they thought someone else would contribute
- 3) How much they liked the ad

Probably all very correlated. Analyze each separately? Increased risk of Type 1 error. Why?

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MANOVA will analyze these multiple measures together, so that their “shared” variance does not create the mathematical possibility of a Type 1 error.

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You definitely need a computer to do this.  
Don't try this at home...

# Analysis of Covariance

Example: Can women be more assertive with a woman than with a man?

40 Female Participants

Assess assertiveness (score from 0 – 100)

Then randomly assign to role play situations in which a Male or Female makes an unreasonable request (“Please go 50 miles out of your way to pick up my order at REI because I don’t want to pay for the gas to do it myself.”)

Examples of assertive responses...?

# Analysis of Covariance (cont.)

Participant makes response and is scored from 1 – 5 by raters.

After 10 responses, she has a totaled score from 10 (low) – 50 (high).

How to analyze this data set?

Answer: Treat “Male or Female” variable as a Between Groups Variable and

Treat the “Trait Assertiveness” variable as a correlational variable (note, NOT IV).

# Analysis of Covariance (cont.)

Result:

Main effect for “male or female” making request

Association (sort of main effect) for “Trait assertiveness” with responses

**Most Importantly, Interaction!**

Example: Most women, regardless of their “trait assertion” score, have trouble being assertive with man, but only those with low scores have trouble being assertive with a woman.

# SUMMARY

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1) Main Effect for Between Groups IV

2) Main Effect for Within Subjects

3) Interaction of Both Variables

(Both Within Groups)

# SUMMARY CONT.

MANOVA will analyze multiple measures together, so that their “shared” variance does not create the mathematical possibility of a Type 1 error.

ANCOVA analyzes one variable as discrete and one as continuous.