



Intro to Stats

ANOVAs

ANOVA

- ▶ Analysis of Variance (ANOVA)
- ▶ Difference in two or more average scores in different groups
- ▶ Each participant tested once
- ▶ Same outcome tested in each group
- ▶ Two or more groups
- ▶ Simplest is one-way ANOVA (one variable as predictor); but can include multiple predictors

What it does

- ▶ Differences between the groups are separated into two sources of variance
 - Variance from within the group
 - Variance from between the groups
- ▶ The variance between groups is typically of interest

When to use it

- ▶ Use when:
 - you are examining differences between groups on one or more variables,
 - the participants in the study were tested only once and
 - you are comparing more than two groups

Terms

- ▶ Factor: the variable that designates the groups to be compared
- ▶ Levels: the individual comparable parts of the factor
- ▶ Factorial designs have more than one variable as a predictor of an outcome

Conceptual Calculation

- ▶ F is based on variance, not mean differences
- ▶ Partial out the between condition variance from the within condition variance

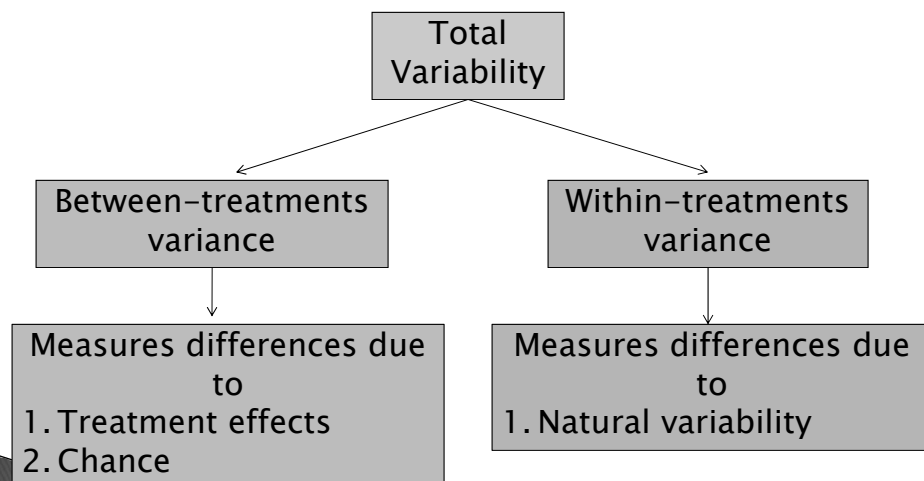
Calculation

$$F = \frac{MS_{\text{between}}}{MS_{\text{within}}}$$

$$MS_{\text{between}} = SS_{\text{between}} / df_{\text{between}}$$

$$MS_{\text{within}} = SS_{\text{within}} / df_{\text{within}}$$

Basic Logic of ANOVA



SS between

$$SS_{\text{between}} = \frac{\sum(\Sigma X)^2}{n} - \frac{(\sum \Sigma X)^2}{N}$$

ΣX = sum of scores in each group

$\sum \Sigma X$ = sum of all the scores across groups

n = number of participants in each group

N = number of participants (total)

SS within

$$SS_{\text{within}} = \sum \Sigma (X^2) - \frac{\sum(\Sigma X)^2}{n}$$

$\sum \Sigma (X^2)$ = sum of all the sums of squared scores

$\sum(\Sigma X)^2$ = sum of the sum of each group's scores squared

n = number of participants in each group

SS total

$$SS_{\text{total}} = \sum \sum (X^2) - (\sum \sum X)^2 / N$$

$\sum \sum (X^2)$ = sum of all the sums of squared scores

$(\sum \sum X)^2$ = sum of all the scores across groups squared

N = total number of participants (in all groups)