

Week of April 6

1. ANCOVA: What it is
2. ANCOVA: What it's good for
3. ANCOVA: How to do it
4. ANCOVA: An example

ANCOVA: What It Is

- ANCOVA (Analysis of Covariance) is a statistical method that removes the effect of a control variable (the covariate) from the dependent variable before conducting a between-groups comparison
 - The covariate is usually a variable that (a) may correlate with the dependent variable, and (b) may differ among the treatment groups

ANCOVA: What It's Good For

- In experimental designs, ANCOVA can be helpful when random assignment goes awry—when there are important differences among the treatment groups on the covariate
- In quasi-experimental designs (in which pre-existing groups are used as treatment groups), ANCOVA can be helpful for removing important pre-existing differences between the groups

Adjusted Treatment Means

- Adjusted treatment means are estimates of what the treatment means would be if there were no between-group differences on the covariate (i.e., if the covariate were held constant at its mean)
 - In effect, ANCOVA looks for differences among the adjusted treatment means (rather than the raw, unadjusted means)

ANCOVA: MRC Coding

- Use 1 vector for scores on the dependent variable
- Use $a - 1$ vectors to code the independent variable (treatment groups)
- Use 1 vector for scores on the covariate
- Use Transform—Compute to create $a - 1$ vectors to code the interaction between the independent variable and the covariate

ANCOVA: MRC Analysis

- Using Regression—Linear, conduct a hierarchical analysis to separate the effect of the independent variable from the effect of the covariate
 1. In a first Block, enter the covariate as a predictor
 2. In a second Block, add the vectors for the independent variable as predictors
 3. The R^2 for model 1 is the R^2 for the covariate
 4. The change in R^2 from model 1 to model 2 is the R^2 for the independent variable, **controlling for the covariate** (i.e., a semipartial correlation)

ANCOVA: MRC Summary

Source	R^2	df	Mn R^2	F
$A_{adj.}$	$R^2_{Y,XA} - R^2_{Y,X}$	$a - 1$	R^2_A/df_A	$Mn R^2_A / Mn R^2_{S/A}$
$S/A_{adj.}$	$1 - R^2_{Y,XA}$	$a(s - 1) - 1$	$R^2_{S/A}/df_{S/A}$	
Total	1.00	$as - 1$		

Note: A is the independent variable and S/A is the error term

Calculating Adjusted Treatment Means: MRC Approach

- Adjusted treatment means can be calculated from the unstandardized regression equation (see pp. 463-464 for an example)
 - Use the unstandardized coefficients from the model predicting the dependent variable from both the independent variable and the covariate
 - For each group, substitute in that group's values on the coding vectors and the grand mean of the covariate

ANCOVA: ANOVA Coding

- Use 1 variable for scores on the dependent variable
- Use 1 variable to code the independent variable (treatment groups)
- Use 1 variable for scores on the covariate

ANCOVA: ANOVA Analysis

- Use GLM—Univariate
- Define the dependent variable as such, the independent variable as a Fixed Factor, and the covariate as such
- To request adjusted means, click Options and Display Means for the independent variable
- Click OK to run the analysis

ANCOVA: ANOVA Summary

Source	SS	df	MS	F
$A_{adj.}$	$SS_{A(adj.)}$	$a - 1$	SS_A/df_A	$MS_A/MS_{S/A}$
$S/A_{adj.}$	$SS_{S/A(adj.)}$	$a(s - 1) - 1$	$SS_{S/A}/df_{S/A}$	
Total	SS_T	$as - 1$		

Note: A is the independent variable and S/A is the error term

An Exercise

- Participants taking anti-anxiety medication are given the option of also receiving meditation training. Those who accept the training are considered the treatment group, and those who decline are considered the control group. The DV is level of functioning at 6-month posttest. The researchers wish to control for a personality variable, Openness to Experience, that they suspect might be related to success of the meditation training.
- Working with a partner, conduct an ANCOVA to determine whether or not there is good evidence that the meditation training is related to posttest level of functioning (after controlling for Openness).