11.7: Variance Explained

Recall that the purpose of ANOVA is to take observed variability and see if we can explain those differences based on group membership. To that end, our effect size will be just that: the variance explained. You can think of variance explained as the proportion or percent of the differences we are able to account for based on our groups. We know that the overall observed differences are quantified as the Total Sum of Squares, and that our observed effect of group membership is the Between Groups Sum of Squares. Our effect size, therefore, is the ratio of these to sums of squares. Specifically:

$$\eta^2 = \frac{SS_B}{SS_T} \tag{11.7.1}$$

The effect size η^2 is called "eta-squared" and represents variance explained. For our example, our values give an effect size of:

$$\eta^2 = \frac{8246}{11266} = 0.73$$

So, we are able to explain 73% of the variance in job test scores based on education. This is, in fact, a huge effect size, and most of the time we will not explain nearly that much variance. Our guidelines for the size of our effects are:

Table 11.7.1: Guidelines for the size of our effects

η^2	Size
0.01	Small
0.09	Medium
0.25	Large

So, we found that not only do we have a statistically significant result, but that our observed effect was very large! However, we still do not know specifically which groups are different from each other. It could be that they are all different, or that only those who have a relevant degree are different from the others, or that only those who have no degree are different from the others. To find out which is true, we need to do a special analysis called a post hoc test.