Effect Size For A One-Way ANOVA

In the last *Guide*, we learned how to calculate the *F*-test statistic for the one-way analysis of variance (ANOVA). It was quite a bit of work, but it allowed us to develop a powerful hypothesis test: Now, we have the ability to investigate whether differences exist along some dimension for as many groups of people as we want. We can look at differences between children, teens, young adults, middle-aged adults, and older adults. We can look at differences between people of different political orientations (e.g., Republican, Democrat, Modern Whig). We can look at differences between lots of different groups!

Now that we have the hypothesis test under our belt, let's learn how to calculate the effect size for the one-way ANOVA. Remember, effect sizes are useful in addition to the overall hypothesis tests because, whereas hypothesis tests tell you **statistical significance**, effect sizes tell you **practical significance**. Essentially, effect sizes allow us to ask and answer the question: Okay, the test is significant, but should I care? Let's see how to do this now.

For all of the *z*- and *t*-tests that we've learned in the course so far, we've used Cohen's *d* as a measure of effect size. In this case, however, Cohen's *d* isn't appropriate because it's designed specifically for those types of tests. Analyses of variance are quite different from *z*- and *t*-tests, so we'll need to use something different. What we end up using is known as "*eta-squared*," represented by η^2. Here's the formula for η^2:

Eta-squared

$$\eta^2 = \frac{SS_{between}}{SS_{total}}$$

where:

$$SS_{total} = SS_{between} + SS_{within}$$

Notice that, for the effect size, we're basically already done! When calculating the *F*-test statistic, we needed to find the Sums of Squares anyway, which is all that is needed for this formula! $SS_{between}$ goes in the numerator, and in the denominator goes the sum of $SS_{between}$ and SS_{within}. **Once you've already found the *F*-test statistic for a one-way analysis of variance, finding the effect size should only take an extra minute**.

Let's do it now using the values we found in the last *Guide*:

$$\eta^2 = \frac{SS_{between}}{SS_{total}} = \frac{952.87}{952.87 + 2598.5} = 0.27$$

That's all, folks! Our effect size is $\eta^2 = 0.27$. Now, I'll note that the interpretation of this value is slightly different from Cohen's *d*. Here's how to interpret η^2:

- Small effect is about .01
- Medium effect is about .06
- Large effect is about .14 or greater

So, in this case, we're dealing with a large effect! What study strategy you use seems to play a large role in your final grade on an exam. Who knew? :)