**Transcript: Interpreting One-way ANOVA Output**

In video, we will go over how to interpret the output from R Commander and SPSS for a one-way ANOVA.

The first thing we're going to look at is our model-level statistics. First, we can see the *F* value as well as the associated degrees of freedom and *p* value for the model. These are shown under the heading “ANOVA” in SPSS. You can see here the same *F* value, degrees of freedom, and significance. The *p* value of less than .05 indicates that the overall model is significant. Another way to say this is that the type of substance is accounting for a significant amount of variance in addiction scores. Based on this overall significant model level statistic, though, we don't know which specific substances are associated with higher or lower scores on the BAM.

To see this, we will need to look at our post hoc tests. Within R Commander, we automatically see descriptive statistics produced for each group. We have our mean and standard deviation on the BAM for each of the three substances. Within SPSS, you can produce this using the descriptive statistics skills that we discussed in the lab on descriptive statistics. Just from looking at this, we can see that participants who are seeking treatment for opioid addiction have the highest scores on the BAM, followed by alcohol, with cannabis as the lowest. From this, though, we still don't know whether these differences are significant.

In order to see whether the differences between each group are significant, we need to look at the results of our Tukey’s HSD test, which is the specific post hoc test that we are using. In this section of the output, we can see each possible comparison between our three groups. So, we have cannabis compared to alcohol, opioids compared to alcohol, and opioids compared to cannabis. For each comparison, we have an estimate of the difference between the two groups. This -6.65 indicates that participants who are seeking treatment for cannabis have lower scores on the BAM compared to participants who are seeking treatment for alcohol addiction. We can also see here, that the *p* value is significant. Next, we can see that in the comparison between opioids and alcohol. Participants seeking treatment for opioids have BAM scores that are 4.1 units higher compared to participants seeking treatment for alcohol addiction. This is also significant, with a *p* value of .01. Finally, the difference between opioids and cannabis is 10.8 points on the BAM, and this is a significant difference. We can see the same values produced in SPSS. For example, if we want to look at the last comparison we discussed (between opioids and cannabis), we can find here—opioids compared to cannabis—and see that the difference is 10.8 and that the *p* value is < .001. SPSS will display each possible comparison twice. It will treat opioids versus cannabis as different from cannabis versus opioids. For example, if we look at cannabis versus opioids, we can see a difference of -10.8. Whereas in R Commander, it only produces the three unique comparisons.

So overall, from this model, we can say that substance is associated with significant variation in BAM scores, and that participants seeking treatment for opioid addiction have the highest BAM scores, followed by alcohol, and then cannabis. All of the pairs of conditions have a significant difference between them.

The last thing we're going to look at is an effect size for ANOVA, which is called *η2* (“eta squared”). *η2* refers to the proportion of the outcome variable that is accounted for by the predictor. If we look in our table here, we can see that the variable that we're looking at is “bam”. This is our outcome variable. If we go into the “Eta-squared”, we can see that the point estimate over the value of *η2* is .198. This indicates that 19.8% of the variance in BAM scores is accounted for by “substance”. In other words, around 80% of the variance is left unexplained and is attributed to other factors that we haven't included in our model. *η2* values can range from zero, reflecting no variance accounted for by the predictor, to 1, indicating that 100% of the variance in the outcome is accounted for by the predictor. In this case, our value of around 20% indicates that a good chunk of the variance in BAM scores can be accounted for by which substance the participant is seeking treatment for.