Introduction to SPSS
Module 6: *t* Test & ANOVA

SLIDE 1, 2, 3
Modules 1, 2, 3, 4 and 5 covered preparing data for analysis, working with variables, summaries and descriptive statistics, correlation and regression, and chi-square. Module 6 will cover *t* Test and ANOVA. Attachments include instructions, sample data, and sample survey.

SLIDE 4
Run a *t* Test
A *t* Test compares differences on a interval/ratio variable in three different formats. A Single Sample *t* Test compares the average of a sample to the known population average. An Independent Samples *t* Test compares the differences between two independent samples (such as males and females). A Paired Samples *t* Test compares the differences between two dependent (paired) samples (such as pre and post measures of the same person).

SLIDE 5
Run a Single Sample *t* Test:
Click on **Analyze** > **Compare Means** > **One Sample *t* Test.**
Enter the population average in the Test *value* box. Move the variable that you want to compare to the population average to the right to the Test *variable* box. Click on OK.

Review Output.
Report the mean, standard deviation, and one or two-tailed (if not indicated, the assumption is two-tailed) and result: $t(9)=2.38$, $p<.05$

SLIDE 6
Run a Independent Samples *t* Test:
Click on **Analyze** > **Compare Means** > **Independent-Samples *t* Test.**
Move the variable that defines the two groups that you are comparing (such as gender) to the *grouping variable* box and it will display as "gender[? ?]". Click on **Define Groups** and define what two groups you will be comparing. For example, if you want to compare groups by gender and used 1 for males and 2 for females, you would enter 1 and 2 in the two boxes. Another example is when you want to compare 2 groups out of a larger number of groups (say you want to compare participants of 2 of the ethnicities in our sample survey), you would enter the corresponding code number for the 2 ethnic groups. Move the dependent variable you want to test to the *Test Variable(s)* box and click on **OK**.

Review Output.
An example of written results: Males' perceived confidence ($N = 32$, $M = 33.7$, $SD = 4.42$) was higher than females' perceived confidence ($N = 28$, $M = 23.7$, $SD = 6.42$); $t(58) = 2.33$, $p < .05$, one-tailed.

SLIDE 7
Run a Paired (Dependent) Samples *t* Test:
Click on **Analyze** > **Compare Means** > **Paired-Samples *t* Test.**
Click on the first variable (such as a pre-test) and see it appear next to *Variable 1:* under *Current Selections.* Then, click on the second variable (such as a post-test) and see it appear next to *Variable 2:*. Press the right arrow to move the variables to the *Paired Variables* box. Click on OK.

Review Output.
Report means and standard deviations and results: $t(73) = 7.7$, $p < .05$

SLIDE 8
An ANOVA (*F* Test) compares differences between groups on interval/ratio variable(s). The analysis focuses on variances as it is analyzing how several means differ (the variation among the means) and, if more than one independent variable, it also analyzes the interaction (the special effect of the combination of the variables). If your findings are significant, you need to do additional (planned) comparisons to determine which means are significantly different.

SLIDE 9
One independent variable:
- Independent Groups: One-Way ANOVA
- Correlated Groups: Repeated Measures ANOVA

Two or more independent variables:
- Independent Groups for all variables: Factorial ANOVA
- Correlated Groups for all variables: Repeated Measures ANOVA
- Mixed (Independent and Correlated variables): Mixed Design ANOVA

SLIDE 10
Run a One-Way ANOVA:
Click on **Analyze – Compare Means – One-Way ANOVA.** Move your dependent variable(s) to the *Dependent List* box. Move your independent variable (defines your groups) to the *Factor* box. If doing multiple comparisons, make a Bonferroni correction to your significance level by selecting *PostHoc* and check **Bonferroni.** To get a table of all possible combinations to locate which comparison(s) is/are significant if overall ANOVA is significant, check **Tukey.** Select **Continue.** Select *Options* and check **Descriptive** and **Means Plot.** Select **Continue > OK.**

Review Output: ANOVA table (get the df (degrees of freedom), F (F value) and Sig. (significance) here.
Results: The means for the second, third, and fourth grade classes were 5.5, 3.5, and 4.4 respectively, $F(4, 118) = 3.33$, $p=.02$. (follow this with the results of your planned comparisons)

SLIDE 11
Run a Factorial ANOVA:
Click on **Analyze > General Linear Model > Univariate.** Move your dependent variable(s) to the *Dependent Variable* box. Move your independent variables to the *Fixed Factor(s)* box. Select *Plots* and put your variables (listed under *Factors*) in the boxes labeled *Horizontal Axis* and *Separate Lines* and click **Add > Continue**. Select *Options* and check *Descriptive Statistics*, click **Continue > OK.**

Review Output: Tests of Between-Subjects Effects reports significance for each variable (third line down is first variable) and the interaction.

Report on each variable separately (as in one-way ANOVA) and report the interaction. An example of written results: A two-factor ANOVA revealed a significant main effect of stress level, $F(2, 118) = 3.33$, $p<.05$. The participants had lower scores in the higher stress condition (M=32) than the low stress condition (M=60). The mid-stress condition participants had scores in between (M=48). No significant effect of year level (first or six grade) was revealed, however, an interaction between stress level and year level was significant $F(2, 118) = 3.33$, $p=.02$.

SLIDE 12
Recap