SPSS Lab 8: ANOVA
Section 1

In this lab, we will be using everything we have learned in our text and applying that information to understand t-tests for parametric and nonparametric data.

THERE WILL BE TWO SECTIONS FOR THIS LAB, EACH CONTAINING TASKS TO COMPLETE. SEE ME WHEN YOU FINISH ONE SECTION TO RECEIVE THE NEXT SECTION.

Create a Word file Lab8.doc to put your solutions to the tasks below. Put your name at the top of the file.

Task 1: Your Data
For this program you will be creating a short data set in SPSS.

1. Open a new **Data Editor** in SPSS
2. Create three **variables**: Person, Dose, Libido
3. Each variable is of numeric **type** with 2 decimal places
4. Include appropriate **Labels** for each variable. Note dose is the amount of Viagra the participant was given and the libido indicates the person's libido over the following week
5. Switching to the **Data View**, enter the following information:
6. When creating Dose, remember that the measure is ordinal such that 1=placebo, 2=low dose, and 3=high dose

Person	Dose	Libido
1.00	Placebo	3.00
2.00	Placebo	2.00
3.00	Placebo	1.00
4.00	Placebo	1.00
5.00	Placebo	4.00
7.00	Low Dose	5.00
8.00	Low Dose	2.00
9.00	Low Dose	4.00
10.00	Low Dose	2.00
11.00	Low Dose	3.00
13.00	High Dose	7.00
14.00	High Dose	4.00
15.00	High Dose	5.00
16.00	High Dose	3.00
17.00	High Dose	6.00

Copy your data (like we did last class) and variable information into your Word document. This should be two separate tables. Make sure to include appropriate titles for the columns.

Task 2: One-Way ANOVA
Now that you have all of your data, you can conduct a one-way ANOVA.

1. Go to Analyze -> Compare Means -> One-way ANOVA
2. Move Libido to the **Dependent List**
3. Move Dose to **Factor**
4. Click **OK**

Copy your results (from the Output table) to Lab8.doc

Answer the following questions in your Word document:

A. Describe the results from your output table using what you know about ANOVA (feel free to look back at chapter 13 in the text).
    a. What were your null and alternative hypotheses?
    b. What can you conclude looking at the F-value and the Significance?

The F-ratio tells us only whether the model fitted to the data accounts for more variation than extraneous factors, but it doesn't tell us where the differences between groups lie. So if the F-ratio is large enough to be statistically significant, then we know only that one or more of the differences between means is statistically significant. Therefore, it is necessary after conducting an ANOVA to carry our further analysis to find out which groups differ. We need a way to contrast the different groups without inflating the Type I error rate. There are two ways to accomplish this task: **planned contrasts** and ***post hoc* tests**.

Task 3: Planned Contrasts
Planned comparisons are done when you have specific hypotheses that you want to test. We can have two hypotheses:

1. Any dose of Viagra to change the libido compared to the placebo group (**contrast 1**)
2. A high dose should increase libido more than a low dose (**contrast 2**)

There are several rules on calculating the appropriate weights for each value, for us, I am going to skip the math and just let you know that the sum of the weights must be 0. So for **contrast 1**:

Placebo	-2
Low dose	+1
High dose	+1

This also satisfies the condition that weights of the doses = placebo (when ignoring their signs).

Now let's put our work into SPSS

1. Go to Analyze -> Compare Means -> One-way ANOVA

Everything should still be set up as in Task 2.

2. Click on **Contrasts…**
3. Check **Polynomial**

4. Change the **degree** to **Quadratic**.

This will make SPSS look for trends in the data that are either Linear or Quadratic.

The lower part of the dialog box is for specifying any planned comparisons (this is where we put in the weights discussed above.

5. In the empty box next to Coefficients, type **-2**
6. Click **Add**
7. Type **1**, click **add**
8. Type **1**, click **add**

Now you have entered the data for the **contrast 1** (remember we have 2).

For **contrast 2** we are only interested in the doses, so let's use the values:

Placebo	0
Low dose	-1
High dose	+1

This effectively nullifies the impact of the placebo.

To enter the data in the table,

9. Click **Next**
10. Repeat steps 5-8 using the new information.
11. Click **Continue**

Task 4: *Post Hoc* Tests

Post hoc tests are done when you have no specific hypotheses. Having created planned comparisons, we don't really need to do a *post hoc* test, but I want to make sure that you know how in case you need them in the future.

You should still have the dialogue box open for One-Way ANOVA.

1. Click on **Post Hoc…**

Using the tests that we are familiar with from class:

2. Select **Scheffe** from the first column
3. Select **Tukey** from the second column
4. With alpha at **0.05**, click **Continue**

Now let's ask for some descriptive statistics

5. Click on **Options…**
6. Select: **Descriptive, Homogeneity of variance test**, **Means Plot**
7. Make sure you **Exclude cases analysis by analysis** under Missing Values
8. Click **Continue**
9. Click **OK**

Task 5: Analyzing the results

Now you should have a large amount of tables and a chart in your output viewer. Copy all the tables and the chart in order into your Word document. Make sure you copy any titles with your results so you know what to discuss.

Answer the following questions in your Word document under the appropriate table or chart:

B. Describe the meaning of the column titles for the **Descriptives** table
C. In the same table, describe the behavior described in the table for the placebo, low dose and high dose.

The next part of the output is the summary table of the Levene's test. This test is designed to test the null hypothesis that the variances of the groups are the same. It is an ANOVA conducted on the absolute differences between the observed data and the mean from which the data came.

In this case, Levene's test is testing whether the variances of the three groups are significantly different. If Levene's test is significant (<0.05) then we can say that the variances are significantly different. This would mean that we had violated one of the assumptions of ANOVA and we would have to take steps to rectify this matter (i.e. transforming the data as we did in earlier labs).

Answer the following question in your Word document under the appropriate table or chart:

D. Based on the value of the Levene Statistic, did we violate an assumption of the ANOVA?

Now let's look at the ANOVA table.

Answer the following question in your word document under the appropriate table or chart:

E. What causes the between-group effects?
F. What causes the within-group effects?

Looking across the first row of data, we get the combined information for the between-group effects.

G. Describe how to read the table (do not look at the impact of the information in the table just yet).
H. Looking at the last column, significance, describe what sig. means (only concentrate on the first value for sig.)
I. Do we have significance?
J. Can you tell which groups are significantly different?

SPSS Lab 7: ANOVA
Section 2

Task 6: Independent Factorial Design ANOVA

When you want to use two or more independent variables (or factors) we can use Two-factor ANOVA, also known as factorial ANOVA.

Since we have two independent variables, we will need a new set of data. First download your new data set, **goggles.sav** of data from our course website (http://laura.goadrich.com/stats/lab.html)

This data was gathered by an anthropologist interested in the effects of alcohol on mate selection at night-clubs. Her rational was that after alcohol had been consumed, subjective perceptions of physical attractiveness would become more inaccurate (known as the 'beer-goggles effect'). She was interested in whether this effect was different for men and women. For the study, she picked 48 students: 24 male and 24 female. She then took groups of eight participants to a night-club and gave them no alcohol (participants received placebo drinks of alcohol-free lager), 2 pints of strong lager, or 4 pints of strong lager. At the end of the evening she took a photograph of the person that the participant was chatting up. She then got a pool of independent judges to assess the attractiveness of the person in each photograph (1 to 100).

To have SPSS do the ANOVA for you:

1. Click on Analyze -> General Linear Model -> Univariate…
2. Select the **dependent** variable as **attract** by moving attract to the dependent variable slot.
3. Let **gender** and **alcohol** each be a **fixed factor** by moving the two variables to the fixed factor box.

At this point, we would conduct a full factorial analysis, which may not be what you want. So let's customize the model

4. Click on **Model…**
5. Under **Specify Model**, click the button for **Custom**
6. With **Interaction** selected under **Building Term(s)**, highlight **gender** and move it to **Model** (by clicking on the arrow above Interaction).
7. Now deselect **gender** by clicking on it again.
8. Select **alcohol** and move it to **Model** (by clicking on the arrow above Interaction).
9. Now select both **alcohol** and **gender** by clicking on them so they are both highlighted.
10. Move the pair to **Model** (by clicking on the arrow above Interaction).

At this point you should have three lines under Model.

11. Click **Continue**

Now let's modify the Profile Plots.

12. Click the button for **Plots…**
13. Select **Alcohol** and move it to the **horizontal axis**
14. Select **gender** and move it to **separate lines**.

Variable order doesn't matter here since we have two independent variables.

15. Click on **Add**
16. Click on **Continue**.

Let's also do some Post Hoc tests to learn all we can about our data.

17. Click on **Post Hoc…**
18. Under **Factors**, move **alcohol** to **Post Hoc Tests for** (using the arrow)
19. Under Equal variances assumed, check **Scheffe** and **Tukey**
20. Click **Continue**

After all of this hard work we want to make sure that we get out all the information we need to analyze the results.

21. Click on **Options…**
22. Under **Factor(s) and Factor Interactions:** move over the three building terms (**gender, alcohol, gender*alcohol**)
23. Under Display select **Descriptive statistics** and **Homogeneity tests**
24. Click **Continue**
25. Click **OK**

Task 7: Analyzing the results

Now you should have a large amount of tables and a chart in your output viewer. Copy all the tables and the chart in order into your Word document. Make sure you copy any titles with your results so you know what to talk about.

Answer the following questions in your Word document under the appropriate table or chart:

K. Looking in the **Descriptive Statistics** table, what does the information in the mean tell us about the effect of alcohol for different genders in the 3 different consumption categories (placebo, 2 Pints, 4 Pints)?
L. Reviewing what you learned in Task 5 about the Levene statistic, did we violate an assumption of the ANOVA?

In the table **Tests of Between-Subjects Effects**, we want to learn if the independent variables have had an effect on the dependent variable.
Answer the following questions in your Word document under the appropriate table or chart:

M. Is there a significant effect of alcohol?
N. What does the strength of the alcohol effect mean in this context?
O. Answer Question M for gender.
P. Answer question N for gender.
Q. Answer Question M for gender*alcohol.
R. Answer question N for gender*alcohol.

Looking at the results for the two **Post Hoc** tables.
Answer the following issue in your Word document under the appropriate table or chart:

S. Briefly discuss the results of the Tukey and Scheffe tests.

Looking at the **Profile Plot** table
Answer the following issue in your Word document under the appropriate table or chart:

T. What is the meaning of parallel lines and non-parallel lines in such a plot (remember that we discussed this in class)?
U. Is there any interaction depicted in the plot? If so, what does the interaction mean for our study?

Task 8: Wrap-up
Print out Lab8.doc and sign the honor code.

Turn in your electronic version of Lab8.doc via blackboard and the paper copy to Laura (with the honor code signed) by the end of the lab session.