# SPSS for Experimental Analysis



(Version 1: 11/10/2015)

# **Background Information**

IBM SPSS Statistics is a software package used for statistical analysis, data management, and data documentation. It allows even novice researchers to do their own statistical analysis with ease. This program is widely used by individuals with interests in social sciences, market research, health research, surveys, government, and education research.

This intermediate workshop is designed to further expand knowledge on statistical analysis and SPSS functions beyond the introductory level such as running descriptive or inferential analysis types, make charts with curves and change measurement types in chart builder, transform data, importing excel files, and using the variable window to manage data more effectively.

## **Required Skills**

Before beginning, the following skills are required:

- Basic knowledge of Statistical terminology
- Basic knowledge of SPSS functions
- Experience with software navigation (keyboard and mouse)
- Basic Excel knowledge

# Agenda

- Entering Raw Data
  - o Defining variables
  - o Entering Data
- How to sort data in Data view
- How to run Inferential analysis (Pearson correlation, t-test, regression, chi square ANOVA One-Way, ANOVA Multivariate, Post-Hoc)
- Format charts

# Sorting Your Data in Data View

Sorting your data visually organizes your data

- 1. Select Data > Sort Cases
- 2. In the *Sort Cases* window select your variable you wish to sort and move it to the *Sort By* window
- 3. Select your Sort Order and select Okay

<ul> <li>Sort Cases</li> <li>Participant</li> <li>Gender</li> <li>How often participa</li> <li>Hours participant sp</li> <li>NumberOfFBFriends</li> <li>How important Face</li> </ul>	Sort by:
Save Sorted Data	lata Reset Cancel Help

Figure 1 - Sort Cases window

Your data is now changed in the Data View tab

Activity: Sort the data by score in ascending order

# **Testing Reliability**

### **Crosstabs and Chi-Square**

- 1. Go to the top menu
- 2. Select Analyze > Descriptive Statistics > Crosstabs
- 3. A dialog box will appear, select your independent variable in the left box and move it over to *Row(s)* using the arrow button
- 4. Select your dependent variable and move it over to the *Column(s)* box
- 5. To find the Chi-Square: Click *Statistics > Chi-square > Continue*

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Figure 2 - Crosstabs: Statistics window in from of the Crosstabs window (step 5 shown)

6. Click the Okay button

Activity: Make a crosstab with a chi-square of score and watch

## **Scale Reliability**

To analyze weather or not two observers recorded a behavior correctly you can use the reliability tool under the scale analysis

- 1. In the tope toolbar select: Analyze > Scale > Reliability Analysis
- 2. Click over the two variables for comparison over to Items
  - a. You can add extra tests under statistics
- 3. Once finished click OK
- 4. Your reliability will appear in the output window

## **Splitting your Data**

Splitting the data in your .spv file allows you to temporarily compare different tests across subsets of your data. If you wanted to compare t-test of treatment and test scores but also wanted to see the difference in these results across gender, splitting the file will give you two t-test results: one for each gender.

#### **Creating a split**

- 1. Go to the top menu
- 2. Select *Data > Split File*. The Split File dialog box will appear.
- 3. Move the variable you wish to split your file by to the *Groups Based on* box using the arrow button.
- 4. Choose either: Compare Groups or Organize output by groups
- 5. Select OK when finished.

Keep in mind that once you split your data your file will appear to be no different, so it's best to remove the split as soon as you are finished to prevent obtaining skewed results.

#### **Removing a split**

- 1. Go to the top menu
- 2. Select *Data > Split File*. The Split File dialog box will appear.
- 3. Select Analyze all cases, do not create groups.
- 4. Select OK when finished.
- Alternativly you can use the syntax command: SPLIT OFF.

## **Pearson's Correlation**

A correlation is a statistical device that measures the strength of a degree of a supposed linear association between two or more variables. One of the more common measures used is the Pearson Correlation, which estimates a relationship between two interval variables.

- 1. Go to the top menu
- 2. Select Analyze > Correlate > Bivariate. The Bivariate Dialog Box will open
- 3. Decide what variables you want to correlate (you can do many at once)

- 4. Move your variables over to the *Variable* box using the arrow button
- 5. Select the Pearson Correlation Coefficient check box (if not already checked)
- 6. Select the *two-tailed* or *one-tailed* test of significance bubble

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Figure 3 - Bivariate Correlations window (step 4 shown)

7. Click Okay and the output viewer window will appear with the correlations table

#### Options

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Under the Options dialogue window you can add descriptive statistics to your Pearson correlation.
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Activity: Create a Pearson's Correlation using <i>Minutes</i> , and Sco	re
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# Linear Regression (Independent T-test) Analysis

Regression analysis is about predicting the future (the unknown) based on data collected from the past (the known). Such an analysis determines a mathematical equation that can be used to figure out what will happen within a certain range of probability. The analysis is performed on a single dependent variable and it takes into account which independent variables have more effect than others. One type of regression analysis linear regression, which is used when the projections are expected to be in a straight line with actual values.

- 1. Go to the top menu
- 2. Select Analyze > Regression > Linear
  - The Linear Regression window will appear

- 3. Select your dependent variable and move it to the *Dependent* box using the arrow button
- 4. Select your independent variable(s) and move them into the *Independent(s)* box using the arrow button

Linear Regression  Age in years [age]  Marital status [m  Years at current a  Income category i  Price of primary v  Primary vehicle p  Level of educatio  Years with curren	Dependent:	Statistics Plo <u>t</u> s S <u>a</u> ve Options Bootstrap
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Figure 4 - Linear Regression window (steps 1-4 completed)

#### 5. Click Okay

Several tables will appear in the output window, the *Coefficients*<sup>a</sup> table contains the coefficients required to make predictions.

	Coefficients <sup>a</sup>							
		Unstandardized Coefficients		Standardized Coefficients				
Model		В	Std. Error	Beta	t	Sig.		
1	(Constant)	53.108	2.330		22.794	.000		
	Level of education	6.327	.817	.096	7.742	.000		
аD	)ependent Variable: Hi	ousehold incom	e in thousands					

a. Dependent Variable: Household income in thousands

Figure 5 - Coefficients table

Activity: drag score to the test variables box, and move watch to group variable

An independent T-test is used to determine the likelihood that two independent data samples came from populations with identical means. If this were true, then the difference between the means should equal zero. In this case, the null hypothesis would indicate that two means are equal.

Two variables are required in the data set. One variable is the measured parameter. Examples include weight, height or frequency. The second variables divide the data set into two groups. The means of light and dark groups will be compared.

- 1. Go to the top menu
- Select Analyze > Compare Means > Independent Samples T Test. The Independent-Samples T Test dialog box will open
- 3. Select continuous variables that you want to test from the list

- 4. Click on the arrow that will send them to the Test Variables box
- 5. Select the categorical variable from which you are going to extract the groups for comparison and send it to the *Grouping Variable* box by pressing the lower arrow

000 In	dependent-Samples T Test
Rame of the stude	Test Variable(s):       Options         Height of the stude       Bootstrap         Grouping Variable:       Gender(1, 2)
? Reset	Define Groups Paste Cancel OK

Figure 6 - Independent-Samples T Test window (steps 1-5 completed)

- 6. Click on the *Define Groups* button
- 7. The Define Groups window will pop up
- 8. Click Continue after specifying your group values

000	Define Groups	)
• Use specifie	d values	2
Group 1:	1	
Group 2:	2	
O Cut point:		
?	Cancel	Continue

Figure 7 - Define Groups window

9. Click Okay to view your output

#### Options

Using the options tool you can adjust the confidence interval and missing participants

# Paired Sample (Dependent) T-Test

This type of t-test is used if an observed difference between the two means of a paired samples set is statistically significant. It is the same test as a dependent t-test

- 1. Select Analyze > Compare Means > Paired Samples T-Test
- 2. Highlight the two variables upon which you want to run your analysis. When you have the two highlighted, send them over to the right column with the arrow button. You can then define more variable pairs if you wish, but if that's all you want, then just click *OK* 
  - a. Under Options you can set the Confidence Interval Percentage

000	Pa	ired–Samples T Test	
<ul> <li>Gender of the stud</li> <li></li></ul>	Paired Pair 1 2	Variables: Variable1 Variable2 I Height o	Options Bootstrap
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Figure 8 - Paired-Samples T Test window (step 2 shown)

#### **Options**

Using the options tool you can adjust the confidence interval and missing participants

# **Independent T-Test**

This test requires a categorical and a quantitative value

- 1. In the Data View tab Go to the top menu
- 2. Select Analyze > Compare Means > Independent Samples T Test
- 3. Move your dependent quantitative variable to the Test Variable box
- 4. Move your independent qualitative variable to the *Grouping Variable* box
  - a. Click Define Groups. Add the coded values of your variable
- 5. Select Ok when finished

## **ANOVA**

#### **One-Way ANOVA**

One-way analysis of variance (One-Way ANOVA) is the analysis of the variance of values (of a dependent variable) by comparing them against another set of values (the independent variable). It is a hypothesis that the mean of the tested variable is equal to that of the factor.

- 1. In the Data View tab Go to the top menu
- 2. Select Analyze > Compare Means > One-Way ANOVA
- 3. Move your dependent variable to the *Dependent list* box
- 4. Move your independent variable to the Factor box
  - a. Click Options if you want to add any extra statistics to your analysis

🔚 One-Way ANOVA	
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Figure 9 - One-Way ANOVA window (steps 3 and 4 shown)

5. Click OK. The output viewer window will open showing your One-Way ANOVA

#### **Post Hoc**

To add an multiple comparisons (like a Tukey, Bonferroni, etc.) use the *Post Hoc.*. dialogue window, you can also change the significance level here as well.

One-Way ANOVA: Post Hoc Multiple Comparisons							
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🔲 <u>B</u> onferroni	Tukey	Type I/Type II Error Ratio: 100					
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Significance level: 0.05							
Continue Cancel Help							

Figure 10- Post Hoc dialogue window

1. Activity: Make a One-Way ANOVA with score as the Dependent and watch as the factor

## **GLM Univariate**

To make a univariate glm

- 1. In the Data View tab Go to the top menu
- 2. Select Analyze > General Linear Model > Univariate
- 3. Move your dependent variable to the *Dependent list* box
- 4. Move your independent variables to the Factor Factors box
- 5. Press OK when finished. The output viewer window will open showing your Univariate ANOVA

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Figure 11 - Univariate window

#### Post Hoc

To add an multiple comparisons (like a Tukey, Bonferroni, etc.) use the Post Hoc.. dialogue window

#### Options

You can open this dialogue window to display additions to your univariate test such as estimate of effect size, descriptive statistics, etc.

#### Plots

🙀 Univariate: Options	23					
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(OVERALL)	watch*interaction					
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interaction						
watch*interaction						
	Compare main effects					
	Confidence interval adjustment					
	LOD(hone)					
Display						
Descriptive statistics	🗐 <u>H</u> omogeneity tests					
Estimates of effect size	Spread vs. level plot					
Observed power	Residual plot					
Parameter estimates	Lack of fit					
Contrast coefficient matrix	General estimable function					
Significance level: .05 Confidence intervals are 95.0 %						

Activity: Make a GLM univariate with score and interaction and watch as the IV

## **Legacy Charts**

- 1. Go to the top menu and select Graphs > Legacy Dialogs
- 2. Select the chart you want to make
- 3. A dialogue window will appear asking you to choose the type of sub-chart. Click *define* ones you selected the type of chart you want to create.

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Figure 13 - selecting a Legacy Dialog chart

- 4. A new dialogue window will appear allowing you to build your chart
- 5. Click on the variables you want to move in the Y and X axis and drag them over using the button.
- 6. Click on *Options* to add confidence intervals, standard error, standard deviation and special case labels
- 7. Click OK when finished
- 8. Your chart will appear in the output window.

# Wrapping Up:

- Opening your existing .sav file
  - $\circ \quad$  open files from the welcome menu or from the Data Editor
  - Don't forget to save often
- Sorting data from SPSS organizes your data
- If you need to create a new variable from an old one use the Transformation tool
- Pearson's correlations are labeled as bivariate correlations in SPSS
- Linear Regression analysis

- Independent and paired sample T tests are found under *Compare Means* in the analyze drop down
- You can create a chi-square analysis through the crosstab feature
- While ANOVA is found under *Compare Means* MANOVA's are found under *General Linear Model*
- There are many chart formatting options in the *Chart Editor*, just double click on your chart in the Output Viewer to access this