# **Psychology 311 – Introduction to Statistics**

# Lab Manual

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# Section 1 - Getting Started

This manual will provide directions for the 10.1 version of SPSS, a statistical program. However, you may use the 7.5 student version to complete lab assignments. For our purposes, there are only minor differences between the two programs.

# Opening the Program

Once your computer is on and you are in Windows, click one time on the "Start" button at the left-hand bottom corner of the screen. Go to "Programs" and click on it once. Select SPSS 10.1 from the list of programs by double clicking on it.

SPSS will open to a blank datasheet:

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You can immediately start putting data into the datasheet, or open a previously saved file.

# Opening a Saved Data File

Go to "File" at the top right-hand corner of your screen. Select "Open", then select "Data". From there, select the correct drive (A: from floppy; C: from hard drive), and either select the file from the list provided, or type in the file name. The saved data will open to the datasheet.

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Entering Data to Datasheet

Variables are listed in columns, not rows. There are two types of variables you can place into the datasheet:

- A. Raw scores i.e., actual scores such as 145 for a person's weight.
  - B. Categorical values coded numerical values for categorical data.
    - Freshman = 1 Sophomore = 2 Junior = 3 Senior = 4

Ex:

# Labeling Variables

Variables are labeled by clicking one time on the "Variable View" tab at the bottom left-hand corner of the screen. This will bring you into a screen that summarizes information about each variable. Clicking on the variable of interest will highlight that variable (which should be listed as var00001, var00002, etc.). Once highlighted, change the variable name by typing in the desired name.



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<b>2</b>												
	Name	Туре	Width	Decimals	Label	Values						
1	gender	Numeric	8	0		None	No					
2	. year	Numeric	8	0		None	No					
3	l weight	Numeric	8	0		None	No					
4	iq	Numeric	8	0		None	No					
E	i pet	Numeric	8	0		None	No					
E	i stress	Numeric	8	0		None	No					
7												
L	abel Variables		÷	# of Decimals	С	ategorical Value	es					

## Coding Categorical Values

Categorical values can be entered into the dataset. To identify the categorical values click one time on the "Variable View" tab at the bottom left-hand corner of the screen.

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30	. View	ialala V/ia	

Once in the variable view screen click on the "Values" box that corresponds to the variable of interest.

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	Name	Туре	Width	Decimals	Label	Values	
1	gender	Numeric	8	0		None	No
2	year	Numeric	8	0		None	No
3	weight	Numeric	8	0		None	No
4	iq	Numeric	8	0		None	No
5	pet	Numeric	8	0		None	No
6	stress	Numeric	8	0		None	No
7							

This will open a "Value Labels" menu box, which allows a values to be assigned to numbers in each variable.

Value Labels	? ×
Value Labels Value: 2 Value Labels Value Labels female  Add 1 = "male" Eemove	Cancel Help

For example, in the "Gender" variable, 1 signifies a male subject, whereas 2 signifies a female subject. Therefore, type "1" for value, and "male" for value label. Then click add. After clicking add, the program immediately brings you back to the value field to allow labeling of another variable. Continue labeling for each value. When complete click on "OK" one time.

You will then be brought back to the "Variable View" menu. To return to the datasheet click on the "Data View" tab one time.

# Saving Data

To save data, click one time on "File" in the top left-hand corner of the screen. Select "Save". Select drive data will be saved to and type in a file name. **The suffix for any SPSS dataset must be .sav** - SPSS will not recognize a dataset without the suffix .sav.

So for our data, if we wanted to call it stats, our file name would be: stats.sav

# Saving Output

To save output, while in output screen, click one time on "File" and select "Save". The suffix for any SPSS output must be .spo – SPSS will not recognize an output without the suffix .spo.

So for our output, if we wanted to call it stats, our file name would be: stats.spo

# Example Dataset

This example dataset will be used throughout the manual to demonstrate how to use the SPSS program to complete various types of statistics.

Student Name	M/F	Year	Weight	I.Q.	Pet Owner	Stress Level
Jimmy	М	Freshman	220	80	Yes	6
Chris	М	Senior	185	110	No	5
Susan	F	Freshman	104	100	Yes	2
Kay	F	Senior	137	85	Yes	1
Peter	М	Freshman	156	70	No	6
Cindy	F	Junior	130	110	Yes	3
Mary	F	Senior	145	85	Yes	1
Patty	F	Junior	115	90	No	7
Joanne	F	Sophomore	170	115	No	4
Liz	F	Sophomore	102	100	No	5
Renee	F	Junior	149	120	No	3
Rob	М	Sophomore	192	130	No	7
Mike	М	Freshman	180	85	Yes	3
Roger	М	Senior	230	90	No	5
Sandy	F	Freshman	165	115	Yes	1
Steve	М	Junior	199	100	Yes	2
John	М	Sophomore	240	110	Yes	1
Bill	М	Junior	170	100	No	5
Scott	М	Sophomore	175	100	No	4
Nick	М	Freshman	160	90	No	6

Dataset	in	SPSS:

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1 : g	ender		1				
		gender	year	weight	iq	pet	stress
	1	1	1	220	80	1	6
	2	1	4	185	110	2	5
	3	2	1	104	100	1	2
	4	2	4	137	85	1	1
	- 5	1	1	156	70	2	6
	6	2	3	130	110	1	3
	- 7	2	4	145	85	1	1
	8	2	3	115	90	2	7
	9	2	2	170	115	2	4
	10	2	2	102	100	2	5
	11	2	3	149	120	2	3
	12	1	2	192	130	2	7
	13	1	1	180	85	1	3
	14	1	4	230	90	2	5
	15	2	1	165	115	1	1
	- 16	1	3	199	100	1	2
	17	1	2	240	110	1	1
	18	1	3	170	100	2	5
	19	1	2	175	100	2	4
	20	1	1	160	90	2	6
	21						
12	00						

You may view the dataset or output file at anytime by clicking on either the SPSS data button (after you name your dataset, the name will be displayed on this button - in this example, the dataset button was named "statslab".) or the SPSS output button at the bottom of the screen.



# Section 2 - Frequency Distributions and Descriptive Statistics

# Frequency Distribution

To obtain a frequency distribution click one time on "Analyze", go to "Descriptive Statistics", then "Frequencies".

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			≝			Desc	riptive Sta	atistics	۲	<u>F</u> requ	uencies		
1 : ge	ender			1		Comp	oare <u>M</u> ear	าร	۲	<u>D</u> esc	riptives.		
	1	aon	dor	Voor		<u>G</u> ene	ral Linear	Model	۲	<u>E</u> xplo	ore		race
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	1		1			Regre	ession		×	PI			
	2		1			Class	ify		۲	Þ	2		
	3		2			<u>D</u> ata	Reductio	n	۲	Þ	1		
	4		2			Sc <u>a</u> le	•		۲	5	1		
	- 5		1			<u>N</u> onp	arametric	Tests	۲	p	2		
	6		2			Multip	ole Respo	nse	۲	þ	1		
	7		2		4		145		8	35	1		

From the Frequencies menu, place the variable of interest into the "Variables" box by clicking on the variable one time then clicking on the arrow key. (You may use one variable at a time, several variables, or all the variables. You will receive the statistics you select for each variable in the "Variables" box.)

Frequencies	\$			×
<ul> <li>● gender</li> <li>● iq</li> <li>● pet</li> <li>● stress</li> <li>● weight</li> <li>● year</li> </ul>	•	(ariable(s):		OK <u>P</u> aste <u>R</u> eset Cancel Help
Display frequency tables	s			
	<u>S</u> tatistics	. <u>C</u> harts	Eormat	J
				.

Click on the "Display Frequency Tables" box to get a frequency table. This table will give you the variable values, its frequency, percentage, valid percentage, and cumulative percentage for each variable placed in the "Variables" box.

For example, if we placed "weight" into the "Variables" box, we would have an output like this:

WE	IGHT	
Ν	Valid	20
	Missing	0

					Cumulative
		Frequency	Percent	Valid Percent	Percent
Valid	102	1	5.0	5.0	5.0
	104	1	5.0	5.0	10.0
	115	1	5.0	5.0	15.0
	130	1	5.0	5.0	20.0
	137	1	5.0	5.0	25.0
	145	1	5.0	5.0	30.0
	149	1	5.0	5.0	35.0
	156	1	5.0	5.0	40.0
	160	1	5.0	5.0	45.0
	165	1	5.0	5.0	50.0
	170	2	10.0	10.0	60.0
	175	1	5.0	5.0	65.0
	180	1	5.0	5.0	70.0
	185	1	5.0	5.0	75.0
	192	1	5.0	5.0	80.0
	199	1	5.0	5.0	85.0
	220	1	5.0	5.0	90.0
	230	1	5.0	5.0	95.0
	240	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

WEIGHT

Each weight entered into the dataset is listed in the far left column, with the frequency, percent and cumulative percent for each weight.

# Measures of Central Tendency and Variance

Click one time on "Analyze", go to "Descriptive Statistics", then "Frequencies".



From the Frequencies menu, place the variables of interest into the "Variables" box. Click one time on the "Statistics" box at the bottom of the screen.

Frequencies	s			X
gender       iq       pet       stress       weight       year	Þ	<u>V</u> ariable(s):	1	OK. <u>P</u> aste <u>R</u> eset Cancel Help
Display frequency tables	5			
	<u>S</u> tatistics	: <u>C</u> harts	Eormat	
	·			

Once in the "Statistics" menu, select desired statistic by clicking on the box to the left of the desired statistic. Then click "Continue", which will bring you back to the "Frequencies" menu. If done click "O.K." Selected statistics will be generated in an output file.

Percentile Values	- Central Tendency	Continue
C Quartiles	<u> </u>	Cancel
Cut points for 10 equal groups	☐ Me <u>d</u> ian	Help
Eercentile(s):	☐ M <u>o</u> de	Theip
Add Change Elemove	□ Sum	nidooints
Dispersion	- Distribution	
Std. deviation 🗖 Minimum	Skewness	
∐ <u>Variance</u> Ma <u>x</u> imum     Range     S.E. mean	<u> </u>	

Click one time on "Analyze", go to "Descriptive Statistics", then "Descriptives.

orm	<u>A</u> nalyze	<u>G</u> raphs	<u>U</u> tilities	<u>\</u>	(indow	Help	
Incel	Repo	orts		► E	ut an tu	<del></del> 1 അ	101
Danie II.	D <u>e</u> sc	riptive Sta	atistics	•	Erequ	uencies	
1	Comp	oare <u>M</u> ear	ns	•	Desc	riptives.	
.or	<u>G</u> ene	eral Linear	Model	•	Explo	ore	race
ar	Corre	late		•	Cross	stabs	ress
	<u>R</u> egr	ession		• T			
	Class	ify		►P		2	
	<u>D</u> ata	Reductio	m	► Þ		1	
	Sc <u>a</u> le	э		► 5		1	
	Nonp	parametric	Tests	► þ		2	
	Multip	ole Respo	onse	► þ		1	
	4	145		85		1	
	3	115		90		2	
	2	170		115		2	
-	2	102		100		2	

From the Descriptives menu, place the variables of interest into the "Variables" box. Click on the "Options" box.

gender     iq     ip     pet     stress     weight	Variable(s):	OK Easte <u>R</u> eset
<ul> <li>Image: wear</li> <li>Image: Save standardized values a</li> </ul>	s variables	Qptions

From the options menu select the wanted statistics, then click continue. Once back into the Descriptives menu, click "OK" to complete statistics

Descriptive	s: Option	s 🗙
Mean Discoursion	<u> </u>	Continue
Std. deviation	Minimum	Cancel
∏ ⊻ariance	☑ Ma <u>x</u> imum	
Distribution	I5. <u>E</u> . mean	
<u> </u>	☐ Ske <u>w</u> ness	
Display Order		
<ul> <li>Varia<u>b</u>le list</li> <li>Alphabetic</li> </ul>		
C Ascending mea	ins	
C <u>D</u> escending me	ans	

<u>OR</u>

# Section 3 - Graphing

Bar Charts and Histograms

Click one time on "Analyze", go to "Descriptive Statistics", then "Frequencies".

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<u>D</u> ata	<u>T</u> ransform	Analyze	<u>G</u> raphs	<u>U</u> tilitie:	s <u>V</u>	√indow	<u>H</u> elp	
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•		D <u>e</u> so	riptive Sta	atistics	•	Erequ	iencies	
	1	Com	oare <u>M</u> ear	ns	•	Desc	riptives	
dor	woor	Gene	ral Linear	Model	•	Explo	re	raca
uei	year	Corre	late		•	Cross	tabs	1855
1		Regr	ession		۰T	1		
1		Class	ify				2	
2		Data	Reductio	n		1	1	
2		Sc <u>a</u> l	•			i	1	
1		Nonp	arametric	Tests		1	2	
2		Muļti	ole Respo	nse	•	1	1	
2		4	145		85	i	1	
2		2	115		on		2	

Place the variables of interest into the "Variables" box. Click one time on the "Charts" button at the bottom of the screen.

gender     i     q     i     q	Variable(s):		JK.
<ul> <li>pet</li> <li>stress</li> <li>weight</li> </ul>		B	eset
🛊 year		H	nce elp
Display froguenou t	 I	_	

Select "Bar Chart" or "Histogram". Clicking on "Continue" will return to the Frequencies menu.

Chart Values	Chait Type C None C Bar chaits C Eie chaits C Eie chaits C Histograms	curve	Continu Cance Help
	Chart Values		

Selecting Chart Values: charts can be completed by frequencies (# of each value) or by percentages (percent of total for each value). Make sure to select the correct value depending upon the question asked.

# Stem and Leaf Plots

Click one time on "Analyze", go to "Descriptive Statistics", then "Explore".

sform	<u>Analyze</u> <u>G</u> raphs <u>I</u>	<u>J</u> tilities	Window	<u>H</u> elp	
50	Reports	•	m and	ലംപം	a.]
F	Descriptive Statis	stics 🕨 🕨	Ereq	uencies	
1	Compare <u>M</u> eans	+	Des	priptives	
oor	<u>G</u> eneral Linear M	odel 🕨	Expl	ore	
ear	<u>C</u> orrelate	•	Cros	stabs	- I e
	<u>Regression</u>	•	PI		
	Classify	•	P	2	
	Data Reduction	•	Þ	1	
	Sc <u>a</u> le	•	ā	1	
	Nonparametric T	ests 🕨	þ	2	
	Multiple Respons	e 🕨	þ	1	

Place the variable(s) of interest into the "Dependent List". Under "Display" box in left lower-hand corner select "Plots". Then click one time on "Plots" button.

Explore	
<ul> <li>♦ gender</li> <li>♦ iq</li> <li>♦ pet</li> <li>♦ stress</li> <li>♦ weight</li> <li>♦ year</li> </ul>	Dependent List: Eactor List: Eactor List: Help
Display <u> Display</u> <u> Display</u>	Label Cases by:

When Plots menu opens, select "Stem-and-Leaf" plot from choices. Then click "Continue", followed by "OK".



# Section 4 – Z-Scores

Click one time on "Analyze", go to "Descriptive Statistics", then "Descriptives".



Place variable(s) of interest into the "Variables" box. Then click on "Save Standardized Values as Variables".

$\backslash$		X
	Gender     Ge	Cancel Help
	Save standardiged values as variables	Options

This will create a new variable that will be called zvariable (z before the name of the variable you choose). For example, if we chose weight as our variable, we will now have a new variable, "zweight", **IN OUR DATASET**. Unlike most SPSS calculations, this one will be placed in the dataset, rather than an output file:

<u>E</u> dit	<u>V</u> iew <u>D</u> ata	<u>Transform</u> <u>A</u>	nalyze <u>G</u> raph:	s <u>U</u> tilities <u>W</u>	indow <u>H</u> elp						
; 📟	in 🗐 🔄		- 17 44	<u>* i i </u>	• 🖪 🖻	0					
stress	stress										
	gender	year	weight	iq	pet	stress	zweight				
1	1	1	220	80	1	6	1.38991				
2	1	4	185	110	2	5	.48569				
3	2	1	104	100	1	2	-1.60692				
4	2	4	137	85	1	1	75437				
- 5	1	1	156	70	2	6	26351				
6	2	3	130	110	1	3	93522				
7	2	4	145	85	1	1	54770				
8	2	3	115	90	2	7	-1.32274				
9	2	2	170	115	2	4	.09817				
10	2	2	102	100	2	5	-1.65859				
11	2	3	149	120	2	3	44436				
12	1	2	192	130	2	7	.66654				
13	1	1	180	85	1	3	.35652				
14	1	4	230	90	2	5	1.64826				
15	2	1	165	115	1	1	03100				
16	1	3	199	100	1	2	.84738				
17	1	2	240	110	1	1	1.90661				
18	1	3	170	100	2	5	.09817				
19	1	2	175	100	2	4	.22735				
20	1	1	160	90	2	6	16018				
0.4		·					-				

The reason that z-scores are placed into the dataset rather than an output file is that you may now use the z-scores, instead of the raw scores, for statistical calculations. This can come in handy if you need a standardized number to compare groups tested using different tests/measurement scales.

To demonstrate that you have created this new variable, click one time on "Analyze", go to "Reports", then to "Case Summaries".

sform	Analyze	<u>G</u> raphs	Utilities	W	indow	<u>H</u> elp				
Ett.	Reports >				OLAR	Cubes				
	D <u>e</u> so Comp	riptive Sta pare <u>M</u> ear	atistics I ns I							
ear	<u>G</u> eneral Linear Model <u>C</u> orrelate <u>R</u> egression Classify Data Reduction			:	Repo	ort <u>S</u> umm	naries in Column	is gh		
				. Þ.		1	6	1.389		
				Classify Data Reduction		. Þ		2	5	.485
					Data Reduction	n I	• p		1	2
	Sc <u>a</u> le <u>N</u> onparametric Tests			۰Þ		1	1	754		
			Tests I	· Þ		2	6	263		
	Multiple Response			· þ		1	3	935		
	4	145		85		1	1	547		
	n	445		00		2	7	4 111		

When in the "Case Summaries" menu, place the variables of interest into the "Variables" box, then click "OK" (in this case zweight).



This will give you an output list of your variable in ascending order (NOT the order in your dataset). Here is an example of the output from "zweight":

Case Summaries <sup>a</sup>							
	Zscore(W EIGHT)						
1	1.38991						
2	.48569						
3	-1.60692						
4	75437						
5	26351						
6	93522						
7	54770						
8	-1.32274						
9	.09817						
10	-1.65859						
11	44436						
12	.66654						
13	.35652						
14	1.64826						
15	03100						
16	.84738						
17	1.90661						
18	.09817						
19	.22735						
20	16018						

# Section 5 – T-Tests

# Single Sample T-Tests

To obtain a single sample t-test, click one time on "Analyze", go to "Compare Means", then "One-Sample T-Test".

orm	Analyze	<u>G</u> raph	s <u>U</u> tilitie	\$	W	indow <u>H</u>	<u>l</u> elp			
jata j	Reports Descriptive Statistics					I∎ III	<b>N</b>	0		
1	Comp	are <u>M</u> e	ans	Þ		<u>M</u> eans.				
	<u>G</u> ene	ral Line	ar Model	•		One- <u>S</u> a	ample	T Test		
ar	<u>C</u> orrelate				Independent-Samples <u>I</u> Test					
_	<u>R</u> egression				Paired-Samples T Test					
_	Class	ify		٠	<ul> <li><u>O</u>ne-Way ANOVA</li> </ul>					
	<u>D</u> ata	Reduct	ion	+	P		1		2	
	Sc <u>a</u> le			۲	F		1		1	
_	<u>N</u> onparametric Tests			►	Þ		2		6	
	Muļtip	ole Resp	onse	•	þ		1		3	
÷.	4	145		8	35		1		1	1

From the one-sample t-test menu, place the variable(s) of interest into the "Test Variable(s)" box. Place the population mean to be tested into the "Test Value" box.

le T Test	×
Test Variable(s):	OK Paste Deset Cancel Help Dptions
	Test Variable(s):

By clicking on the "Options" button, you may set your confidence interval level. The default level set by SPSS is 95%, and unless otherwise stated, this will also be the default for our class.



The output generated by the one-sample t-test will look like this:

# T-Test

	Test Value = 145								
				Mean	95% Confidence Interval of the Difference				
	t	df	Sig. (2-tailed)	Difference	Lower	Upper			
WEIGHT	2.449	19	.024	21.20	3.08	39.32			
1	2	3	4			5			

#### **One-Sample Test**

- 1. Name of variable selected
- 2. The actual t value calculated by SPSS
- 3. The degrees of freedom for our t-test
- 4. The alpha level of our t-test. This is the actual alpha level for our test. If our critical alpha is .05, then any value .05 or less in this box indicates a significant t value. If the alpha level is greater than .05, our t was not significant.
- 5. The confidence intervals for our test.

# Independent Samples T-Test

To obtain an independent samples t-test, click one time on "Analyze", go to "Compare Means", then "Independent-Samples T-Test".

rm	<u>A</u> nalyze	<u>G</u> raphs	Utilities	W	indow <u>I</u>	<u>H</u> elp			
<u>a.</u> p	Re <u>p</u> o Desc	orts priptive Sta	) atistics		₫	<b>I</b> 🐼	0		
1	Comp	pare <u>M</u> ear	ns D	Ē	<u>M</u> eans				
	<u>G</u> ene	eral Linear	Model I	•	One- <u>S</u> a	ample T	Test		
41	<u>C</u> orrelate				Independent-Samples <u>I</u> Test				
_	<u>R</u> egr	<u>R</u> egression			Paired-Samples T Test				
_	Class	sify		•	One-Way ANOVA				
	<u>D</u> ata	Reductio	n I	F		1	2		
	Sc <u>a</u> le	в		Ē		1	1		
_	<u>N</u> onp	parametric	Tests I	· þ		2	6		
	Muļti	ple Respo	nse I	þ		1	3		
	4	145		85		1	1		

From the independent-samples t-test menu, place the dependent variable into the "Test Variable(s)" box. Place the independent variable into "Grouping Variable" box.

健 gender	<u>⊺</u> est Variable(s):	OK Paste
⊯>pet ⊯>stress		<u>R</u> eset Cancel
	Grouping Variable:	Help

The independent variable has to be defined. For example, in our variable year, 1 =freshmen, 2 = sophomores, 3 = juniors, and 4 = seniors. Since this is a t-test, we can only compare two groups to one another. Therefore, if we were interested examining if there is a significant difference in weight between freshmen and sophomores we would click on the "Define Groups" button and input 1 for "Group 1" and 2 for "Group 2". However, if we were interested in freshmen vs. seniors, we would input 1 and 4.

Define Groups	X
	Continue
Group <u>1</u> : 1	Cancel
Group <u>2</u> : 2	Help
C <u>C</u> ut point:	

Once groups are defined, click on the continue button and you will be returned to the independent-samples t-test menu.

At the independent-samples t-test menu, by clicking on the "Options" button, you may set your confidence interval level. The default level set by SPSS is 95%, and unless otherwise stated, this will also be the default for our class.

Independent-Samples	т т 💌
Confidence Interval: 📴 %	Continue
Missing Values	Cancel
Exclude cases <u>a</u> nalysis by analysis     Exclude cases listwise	Help

The output generated by the one-sample t-test will look like this:

Levene's Test for Equality of Variances				t-test for Equality of Means						
							Mean	Std. Error	95% Col Interva Differ	nfidence I of the rence
		F	Sig.	t	df	Sig. (2-tailed)	Difference	Difference	Lower	Upper
WEIGHT	Equal variances assumed	.190	.673	443	9	.668	-11.63	26.269	-71.058	47.791
	Equal variances not assumed			431	7.388	.679	-11.63	27.000	-74.806	51.539
1	2	3		4	5	6			7	

#### Independent Samples Test

- 1. Selected Variable.
- 2. Test for equal variances (assumption for t-test). Top line equal variance, bottom unequal variance.
- 3. If the alpha level in the "Sig" box is less than .05, it indicates that there is a significant difference in variances and therefore we should use the lower t value. However, if the "Sig" level is greater that .05 than the variances are equal and we can use the top t value (as in this example our t value is -.433 with a df = 9).
- 4. The t value calculated by SPSS.
- 5. The degrees of freedom for our t value.
- 6. Our alpha level (see above).
- 7. Confidence levels (see above).

# Section 6 - Analysis of Variance (ANOVA)

# One Factor ANOVA

Click one time on "Analyze", go to "Compare Means" and select "One-Way ANOVA".

In Analyze Graphs Dunnes Window Help	
Begorts Descriptive Statistics	
1 Compare Means  Means	
<u>G</u> eneral Linear Model ► One- <u>S</u> ample T Test	
<u>Correlate</u> Independent-Samples <u>I</u> Test	
<u>Regression</u> Paired-Samples T Test	
Classify	
Data Reduction P 1 2	
Scale ▶ 5 1 1	
Nonparametric Tests > p 2 6	
Multiple Response 🕨 h 1 3	

From the ANOVA menu, place the dependent variable into the "Dependent List" box. Place the independent variable into the "Factor" box (in our example we are examining if there are significant differences in weight between freshmen, sophomores, juniors and senior; therefore, weight is placed into the "dependent list" box and year is placed in the "factor: box).

One-Way /	ANOVA	X
<ul> <li>Image: Image: Image:</li></ul>	Dependent List:	OK <u>P</u> aste <u>R</u> eset Cancel
	Eactor:	Help
	Contrasts Post <u>Hoc</u> Option	ns

There are three boxes at the bottom of the ANOVA menu. Analysis of Variance only tells you that there is a significant difference between groups, but not which groups specifically. Contrasts allow you to look at differences between 2 groups and should be used if a priori contrasts were designed in the experiment. Post hoc comparisons do the same thing contrast do, however, are used when no specific contrasts were intended in the design of the experiment. The most common post hoc test is the Tukey Test.

<u>SD</u> <u>B</u> onferroni     Sjdak     Scheffe <u>R-E-G-W F</u> R-E-G-W Q	□     S-N-K       □     Iukey       □     Tukey's-b       □     Duncan       □     Hochberg's GT2       □     Gabriel	Vetaller-Duncan           Type I/Type II Error Ratio:           Dunnett           Control Category:           Test           © 2-sided © < Cgritrol © > Cogirt
Equal Variances N	ot Assumed	
Tambane's T2	Dunnett's T3	Games-Howell 🔲 Dynnett's C

The options button will allow for descriptive statistics for each of the groups and test for homogeneity of variance.

One-Way ANOVA:	Opti >
Statistics	Continue
Homogeneity-of-variance	Cancel
□ <u>M</u> eans plot	Help
- Missing Values	
Exclude cases <u>a</u> nalysis by analysis	alysis
C Exclude cases listwise	

Select the options wanted, then click "OK" from the ANOVA menu. The output generated will look like:

# Oneway

# ANOVA

WEIGHT

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1669.617	3	556.539	.332	.802
Within Groups	26797.583	16	1674.849		
Total	28467.200	19			

This output should look familiar. It is essentially the same source table that is done by hand in class. The only exception is the last column. The is the actual alpha level for our F value. In this example, the alpha is = .802. Because it is greater than .05, our F value is not significant and we would fail to reject the null hypothesis.

# More Complex Analyses

More complex analyses will not be required in this class, however, you may need them in the future. To complete a factorial ANOVA or a repeated factors ANOVA click one time on "Analyze", go to "General Linear Model", then "Univariate".

n	<u>A</u> nalyze	<u>G</u> raphs	Utilitie	s	W	indow	<u>H</u> elp	
J	Repo	rts		۲	E	lata li		ച്ചത
	D <u>e</u> sc	riptive Sta	tistics	۲	Ë		- I	<ul> <li>•</li> <li>•</li></ul>
1	Comp	oare <u>M</u> ean	s	۲				
i	<u>G</u> ene	ral Linear	Model	Þ		<u>U</u> niv	ariate	et.
_	Corre	late		۲	P	r		
_	<u>R</u> egro	ession		۲	Ы		1	_
	Class	ify		۲	Þ		2	!
	<u>D</u> ata	Reduction	۱ ۱	۲	Þ		1	
	Sc <u>a</u> le			۲	β		1	
	<u>N</u> onp	arametric	Tests	۲	Þ		2	!
	Muļtip	ole Respoi	nse	۲	h		1	

This will get you to the ANOVA menu. Place the dependent variable into the "Dependent Variable" box. The independent variable(s) go into the "fixed factors" box.

📲 Univariate			×
	►	Dependent Variable:	Model
<ul> <li>(♣) pet</li> <li>(♣) stress</li> <li>(♣) weight</li> </ul>		Eixed Factor(s):	Plo <u>t</u> s
() year		R <u>a</u> ndom Factor(s):	Post <u>H</u> oc Save
	►		<u>O</u> ptions
	Þ	<u>C</u> ovariate(s):	
L	►	WLS Weight:	
OK	Paste	Reset Cancel Help	

# Section 7 - Correlation and Regression

# Correlation

Click one time on "Analyze", go to "Correlate", and select "Bivariate".

<u>Analyze</u> <u>G</u> raphs <u>U</u>	tilities <u>W</u> indow <u>H</u> elp
Reports	
Descriptive Statist	ics 🕨 🔜 💌 🤘
Compare <u>M</u> eans	•
<u>G</u> eneral Linear Mo	odel 🕨 📊 🚬 👘
<u>C</u> orrelate	▶ <u>B</u> ivariate
<u>R</u> egression	<ul> <li>Partial</li> </ul>
Classify	Distances
Data Reduction	• 11 11
Sc <u>a</u> le	▶ 5 1
<u>N</u> onparametric Te	ests 🕨 🕽 🔰 💈
Multiple Response	• ▶ <u>)</u> 1

Once in the Bivariate menu, place the variable of interest into the "Variable(s)" box. Two or more variable may be placed into this box. Make sure to select the Pearson Correlation Coefficient and select whether it is a one- or two-tailed test.

Bivariate Correlations	×
<ul> <li>Image: A set of the set of the</li></ul>	OK <u>P</u> aste <u>R</u> eset Cancel Help
Correlation Coefficients ✓ Pearson	Options

By clicking on the "Options" button, you can get means and standard deviations for each of your variables.



The correlation output will look like:

# Correlations

		IQ	WEIGHT
IQ	Pearson Correlation	1	.067
	Sig. (2-tailed)	12	.777
	Ν	20	20
WEIGHT	Pearson Correlation	.067	1
	Sig. (2-tailed)	.777	2
	N	20	20

Correlations

The output will contain the Pearson correlation (r value), the alpha value, and the number of subjects for each correlation. In this example, r = .067, with an alpha of .777. Not surprisingly, there is no significant correlation between a person's weight and their IQ.

# <u>Regression</u> Click one time on "Analyze", go to "Regression", and select "Linear".

-					
Į	Analyze Graphs Utilities	s	Wi	ndow <u>H</u> elp	
Î	Reports	۲	F	പലി	dal
ļ	Descriptive Statistics	۲	Ē		
1	Compare <u>M</u> eans	۲	Г		
î	<u>G</u> eneral Linear Model	۲	h	not	otropo
ļ	<u>C</u> orrelate	۲	μ	her	stress
	<u>R</u> egression	۲		Linear	
	Classify	۲		<u>C</u> urve Estima	tion
	Data Reduction	۲	Ы	1	
	Sc <u>a</u> le	۲	FI	1	
	<u>N</u> onparametric Tests	۲	ÞĪ	2	
-	Multiple Response	۲	Ьt	1	

From the linear regression menu, place the dependent variable (Y variable) in the "Dependent" box and the independent variable (X variable) in the "Independent(s)" box. Ignore the rest of the menu options.

Linear Regre	ession		X
<ul> <li>Image: set and s</li></ul>	$\triangleright$	Dependent: ∲ weight	OK <u>P</u> aste
	Pre <u>v</u> ious	Block 1 of 1 Next	<u>R</u> eset
A MARINE	F	Independent(s):	Cancel Help
	$\rightarrow$	Selection Variable: <u> <u> Fule</u> <u> Case Labels:</u> </u>	
<u>W</u> LS >>	<u>S</u> tatistics	Plots Save Options.	

The output will look like:

# Regression

Model Summary							
~			Adjusted	Std. Error of			
Model	R	R Square	R Square	the Estimate			
1	.010ª	.000	055	39.766			

a. Predictors: (Constant), YEAR

	110		L.
A	NC	IV I	Ψ.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.013	1	3.013	.002	.966ª
	Residual	28464.187	18	1581.344		
	Total	28467.200	19			s

a. Predictors: (Constant), YEAR

b. Dependent Variable: WEIGHT

Coefficientsª

		Unstano Coeffi	dardized cients	Standardi zed Coefficien ts		
Model		в	Std. Error	Beta	t	Sig.
1	(Constant)	165.377	20.852		7.931	.000
	YEAR	.350	8.026	.010	.044	.966

a. Dependent Variable: WEIGHT

The coefficients box provides the slope and y-intercept necessary to create a regression equation.

Predicted Y = slope \* X + Y-intercept

(Constant) B is the Y-intercept (in this example 165.377) The independent variable's B = the slope (in this example Year B = .350)

Y = (.350) (X) + 165.377

# Section 8 - Chi-Square

# No Preference Chi-Square

Click one time on "Analyze", go to "Nonparametric Tests", and select "Chi-Square".

1	<u>A</u> nalyze	<u>G</u> raphs	Utilities	7	<u>//</u> indow	<u>H</u> elp		
1	Rego D <u>e</u> sc Comp	orts riptive Sta pare <u>M</u> ear	atistics ns	• •	- 	<u>.</u>	0	
	<u>G</u> ene Corre	eral Linear	Model	-	р	et	stress	
	Rear	ession			)	1	6	
	Class	ify		•	ו	2	5	
	<u>D</u> ata	Reductio	n	•	)	1	2	
	Sc <u>a</u> le	9		•	5	1	1	Γ.
	Nonp	oarametric	Tests	١	<u>C</u> hi-S	quare		
-1	Muļtij	ole Respo	nse	Þ	Binor	nial		
4		145		8	<u>B</u> uns <u>1</u> -Sar	 mple K-S		E

In the Chi-Square menu, place the variable of interest into the "Test Variable List" box. Make sure "All categories equal" is selected.

📲 Chi-Square Te	st	X
gender     iq     stress     weight     year	Test Variable List	OK <u>P</u> aste <u>R</u> eset Cancel
Expected Range	Expected Values	Help
Get from data	<ul> <li>All categories equal</li> </ul>	
C Use specified range	C ⊻alues:	
Lowen	Add	
Upper:	Change	
	Remove	
		Options
		•

To obtain descriptive statistics, click on the "Options" button and select "Descriptives".



Chi-Square output from SPSS:

# **Chi-Square Test**

# Frequencies

	-	-
-	-	
	_	

	Observed N	Expected N	Residual
yes	9	10.0	-1.0
no	11	10.0	1.0
Total	20		

# Test Statistics

	PET
Chi-Square ª	.200
df	1
Asymp. Sig.	.655

The chi-square value is .200 with an alpha value of .655, indicating there are no significant frequency differences between groups.

# No Difference From Population Chi-Square

Click one time on "Analyze", go to "Nonparametric Test", and select "Chi-Square".

A	Analyze Graphs Utilities Window Help						
I	I Reports Descriptive Statistics						
1	Compare <u>M</u> eans	•					
	<u>General Linear Mod</u>	lel 🕨	h	pet	stress		
	Regression	-	F	1	6		
	Classify	•	Þ	2	5		
	Data Reduction	•	Þ	1	2		
	Sc <u>a</u> le	•	þ.	1	1		
	Nonparametric Test	s 🕨		Chi-Square			
	Multiple Response	•		<u>B</u> inomial			
4	145	8		<u>R</u> uns		E	
	445			_1-5 ample K-5	l		

From the Chi-Square menu place the variable of interest into the "Test Variable List" box. The range of values possible should be entered in the "Expected Range" box. In this example, the total range possible is from 1 to 4. Next, select "Values" from the "Expected Values" box. Population frequency values must be entered **for each categorical** value. It is important that you enter the values in the same categorical order as is in the "Expected Range" box. For category 1 (freshmen), we have one freshman in our population, 2 sophomores, 8 juniors, and 10 seniors.

Chi-Square Te	est	
gender     j     iq     j     pet     stress     weight	Test Variable List:	OK Paste Bese Cance
Expected Range	Expected Values	
C Get from data	C All categorjes equal	
• Use <u>specified</u> range		
Lower: 1	<u>A</u> dd	$\mathcal{I}$
Upper: 4	Change 8	
	Remove 10	
		Options

The Chi-Square output from SPSS:

# Chi-Square Test

	a	YE/	AR	6
× >	Category	Observed N	Expected N	Residual
1	freshman	6	1.0	5.0
2	sophomo re	5	1.0	4.0
3	junior	5	8.0	-3.0
4	senior	4	10.0	-6.0
Total	×	20		

#### Frequencies

# Test Statistics

	YEAR
Chi-Square ª	43.61
df	3
Asymp. Sig.	.000

a. 2 cells (50.0%) have expected frequencies less than
 5. The minimum expected cell frequency is 1.0.

The Chi-Square value is equal to 43.61 and the alpha is equal to .000, indicating a significant difference from the population.

# Chi-Square Test for Independence

Click one time on "Analyze", go to "Descriptive Statistics", and select "Crosstab".



In the crosstabs menu place one variable in the "Row(s)" box and the second variable in the "Columns" box.

📲 Crosstabs		X
<ul> <li>r gender</li> <li>r iq</li> <li>r weight</li> <li>r year</li> </ul>	Row(s):	OK Paste Reset Cancel Help
Display clustered bar cha	arts	
☐ Suppress <u>t</u> ables		
	Statistics Cells Format	

Click one time on the "Statistics" button at the bottom of the menu. In the statistics menu select "Chi-Square"



The Chi-Square output from SPSS:

## Crosstabs

#### Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
PET * STRESS	20	100.0%	0	.0%	20	100.0%

#### PET \* STRESS Crosstabulation

Count								
		STRESS						
		4440-000-000-000-00		med low		med high		extreme
2		no stress	low stress	stress	med stress	stress	high stress	stress
PET	yes	4	2	2			1	
	no			1	2	4	2	2
Total		4	2	3	2	4	3	2

#### Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.613ª	6	.023
Likelihood Ratio	19.887	6	.003
Linear-by-Linear Association	10.227	1	.001
N of Valid Cases	20		

The Chi-Square value equals 14.613, with an alpha of .023, indicating a significant difference between groups, or a significant correlation between owning a pet and the amount of stress experienced.

# Expectations for Completing Labs

By completing labs, you are conveying that you understand how to use SPSS to compute requested statistics. Thus, not only are you expected to include all necessary output to support your answer, you should also know what is NOT necessary and exclude any extraneous output.

# How will I know what is necessary?

Any answer given in a lab assignment, unless otherwise specified, needs output to support the answer. If you have output that is not used in an answer, it is unnecessary and points will be taken off for unnecessary output.

# How do I get rid of unnecessary output?

There are three ways to exclude unnecessary output in any assignment.

- 1. Make sure the only statistics selected are the requested statistics (i.e., the ones you want). Unfortunately, SPSS retains previous settings, and therefore, you may inadvertently get output you do not want. It is best to check that you not only select the statistics you DO want, but also click OFF those statistics you do not want.
- 2. If you complete the analyses and discover unnecessary calculations in the output, you can delete those calculations while in SPSS (before printing). Simply click once anywhere on the unwanted output. It will be highlighted, then hit the delete button on your keyboard. This will remove the selected output. Be sure to select only the output you want to delete, so you don't lose output you need to answer your lab questions.
- 3. If you have already printed out your output and notice unnecessary calculations, merely cross them out by hand and write "unnecessary" next to it, indicating that you are aware that this output is not needed to answer the question.

# Other Expectations

- All answers on the output must be clearly marked with the number of the question next to the appropriate calculation to indicate you understand where the answer came from.
- You may hand write written responses on the output pages, or double-click on the output and type answers in. Either method is acceptable.
- This manual contains information on using SPSS to calculate statistics. The lab assignments will not only require SPSS calculations, but also information from class about statistics to obtain a complete answer. In other words, you also need to know how to interpret the statistics and output that you receive from SPSS.