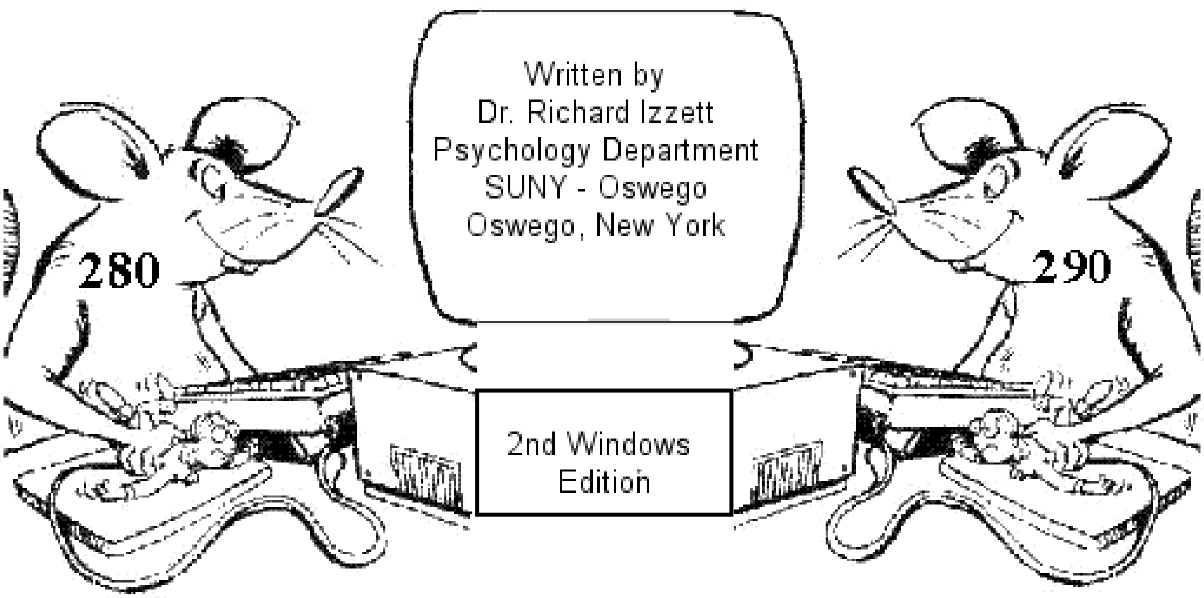
SPSS
Windows

INSTRUCTIONS

FOR
PSYCH. 280 & PSYCH. 290



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Independent Groups t test

For this problem, a researcher was interested in finding out if subjects would agree with a message more if it was delivered to them by a **high** credible speaker than if it was delivered to them by a **low** credible speaker. The researcher felt that people would be **more** likely to agree with a message if it was delivered to them by a **high** credible speaker. Subjects were randomly assigned to one of two conditions. All subjects in the experiment read the exact same message. However for ½ of the subjects the message was purported to have been written by a noble prize winning doctor of medicine. For the other ½ of the subjects the message was purported to have been written by a man doing prison time for medical quackery. The message stressed the importance of exercise for lowering blood pressure. After reading the message, the subjects were then asked to indicate how much they agreed with the speaker on a 15 point scale by circling one of the numbers on a scale that looked like this.

Low agreement: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15: High agreement

The experimenter then recorded the data in a table which looked like this.

Agreement with Low Credible Speaker	**Agreement with High Credible Speaker**
5	8
4	10
4	12
1	10
1	10

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2^{nd} option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.

   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Source** (for source credibility).
6. Click on the white cell in **Row 1** under the word **Label** and type in **Source Credibility**. (Doing this will provide you with a more expansive label for your independent variable in the results output).
7. Click on the white cell in **Row 1** under the word **Value**. The word none will appear along with a small grey box to the right.
   a. Click on the small grey box and a Value Labels window will appear
   b. In the white box next to the word **Value**, type in the number **1**
   c. Click on the white box next to the word **Value Label** and type **Low** (for Low credible source).

d. Click on the **Add** button. 1 = “Low” should now appear in the bottom white box.
e. In the white box next to the word **Value** type in the number **2**
f. Click on the white box next to the word **Value Label** and type **High** (for High credible source)
g. Click on the **Add** button. 1 = “Low”
2 = “High” should now appear in bottom white box
h. Click on **OK** button (top right corner)

8. Click on the white cell in **Row 2** under the word **Name** and type in the word **Agree** (for the Agreement dependent variable).
9. Click on the white cell in **Row 2** under the word **Label** and type in **Agreement Response**. (Doing this will provide you with a more expansive label in the computer print out of the results of your analysis.)

DATA ENTRY PHASE

10. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Source** (for the source credibility independent variable) and Column 2 named **Agree** (for the agreement dependent variable).
11. Enter data for all ten subjects as follows. Click on the white cell at Row 1 Column 1 under Source and enter

1 tab 5 enter. Then mouse to the second row to enter the data for the second case.
1 tab 4 enter. Then mouse to the third row to enter the data for the third case.
1 tab 4 enter
1 tab 1 enter
1 tab 1 enter
2 tab 8 enter
2 tab 10 enter
2 tab 12 enter
2 tab 10 enter
2 tab 10 enter

> The data may also be entered down one column at a time, entering the codes for source, where 1 means low and 2 means high credible source and then moving on to column 2 and entering the responses on the agreement scale.

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **compare means** then
   b. Click on **Independent Samples t -test**
2. Highlight the word **Source by clicking on it** and then
   a. Click on the **lower arrow** to transfer it to the **grouping** variable box. (This is your independent variable).
   b. When the **source ? ?** shows up click on the **Define Groups** box
   c. Type in 1 in Group 1 box
   d. Type in 2 in Group 2 box
   e. Click the **Continue** button
3. Highlight the word **agree by clicking on it** and then
   a. Click on the **upper arrow** to transfer it to the **Test Variable Box** (since this is your dependent variable)
4. Click **OK** A few seconds later a new screen will appear called output 1
5. Your results will appear in a Window. Scroll up using the slide bar on the right to the top of the output. The results of this analysis are presented below.

Group Statistics

	source credibility	N	Mean	Std. Deviation	Std. Error Mean
agreement	low credibility	5	3.0000	1.8708	.8367
	high credibility	5	10.0000	1.4142	.6325

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Mean	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
agreement	Equal variances assumed	2.133	.182	-6.674	8	.000	-7.0000	1.0488	-9.4186	-4.5814
	Equal variances not assumed			-6.674	7.446	.000	-7.0000	1.0488	-9.4502	-4.5498

6. For the problem above the null and alternative hypothesis are spelled out below:

H_{null} The mean agreement score given to a low credible source	will be greater than or equal to	the mean agreement score given to a high credible source
H_{alt} The mean agreement score given to a low credible source	will be less than	the mean agreement score given to a high credible source

7. **Interpretation and APA writing template for Results Above:**

Results indicate that the mean agreement score given to a low credible source was 3 (M = 3.00, SD = 1.87), while the mean agreement score given to a high credible source was 10 (M = 10.00, SD = 1.41). A one tailed independent groups t test indicated that the difference between these two means was significant $t(8) = -6.67$, $p < .05$. These results indicate that the null hypothesis should be rejected and that one should conclude that high credible sources produce more agreement with a message than low credible sources.

Graphics: Creating Line Graphs or Bar Charts

In the instructions that follow, the symbol > means to left click the word which follows the symbol. For example, > graph means to left click the word graph. To create a line graph for the results of the independent groups t test use the following instructions.

Line Graph Instructions:

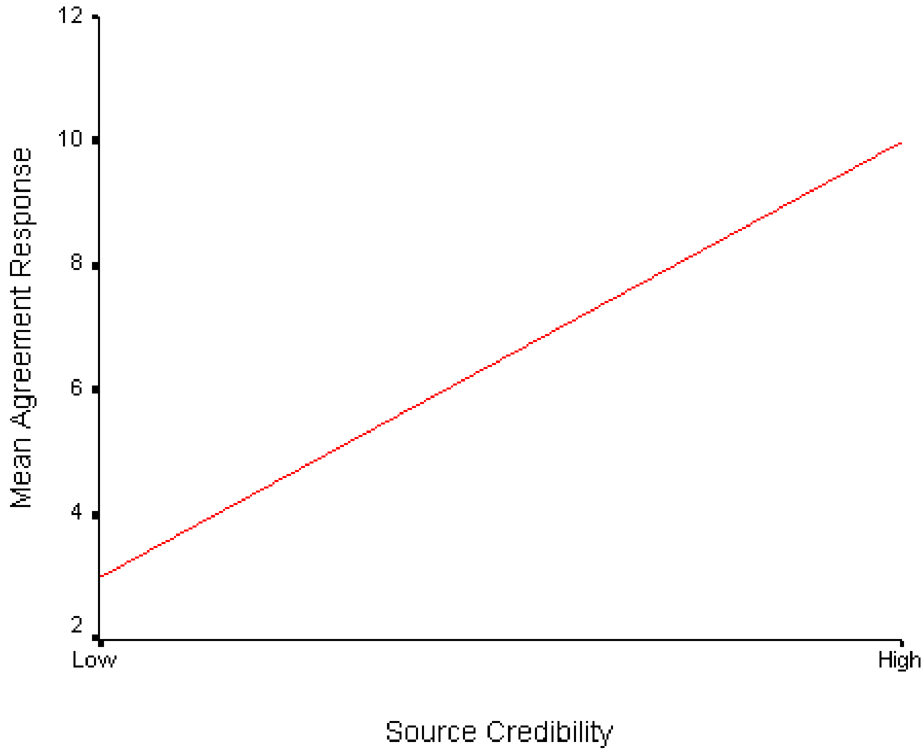
1. > Graph > Line > Summaries for Groups of Cases > Simple > Define
2. Click dot for other summary function
3. Click on dependent variable name (agreement for page 4) then the right pointing arrow to move it to the blank white box titled **variable**
4. Click on the Independent variable name (source credibility for page 4) then the right pointing arrow to move it to the blank white box titled **Category Axis**.
5. Click OK. When you do this a figure is created, however, the independent variable name (source credibility) will be on the left side of the horizontal axis, and the dependent variable name Agreement Response will be on the lower side of the vertical axis, and a frame will circumscribe the figure.

Moving X Axis Labels to Center of Axis

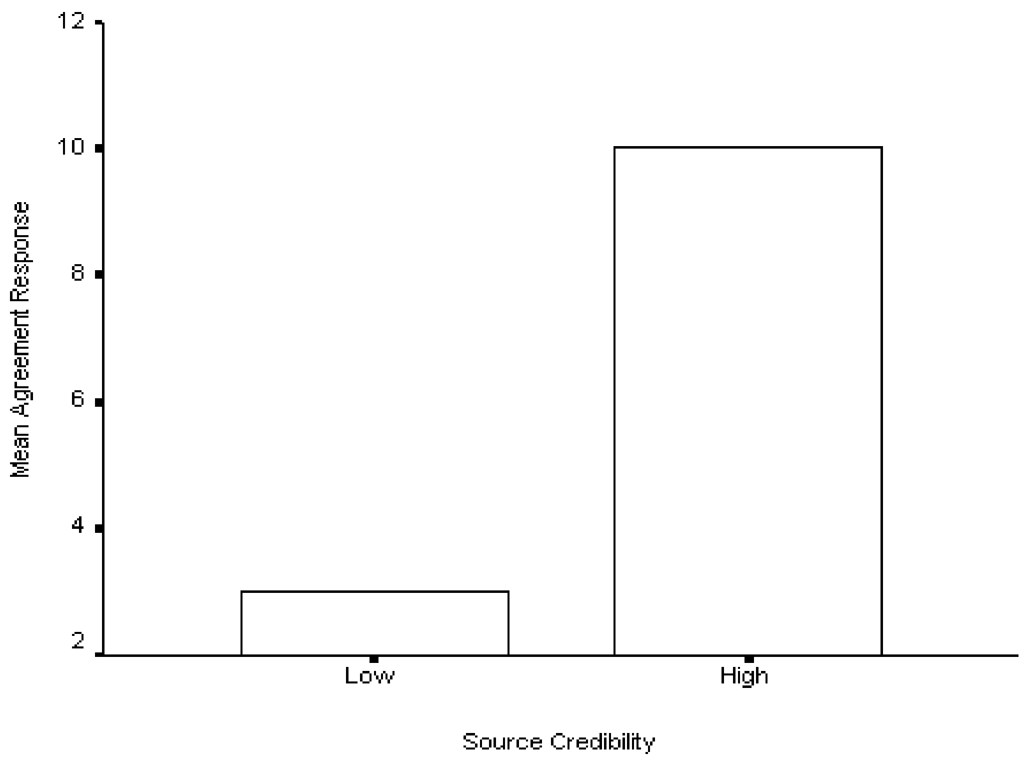
1. Double click on the figure. Doing this will put you into **Chart Editor** mode. Once you are in the **Chart Editor** mode do the following.
2. > chart > inner frame. This will remove the frame surrounding the figure.
3. > chart > axis > ok. This will bring up a scale axis menu with the dependent variable (mean agreement response) in the axis title box. Immediately below is the title justification box with left/bottom showing.
4. Click the down arrow next to left/bottom and highlight the word center.
5. > ok. Doing this will center the agreement response label on the vertical axis.
6. > chart > axis > blank dot next to the word category > ok. This will bring up the category axis menu with the independent variable (source credibility) in the axis title box. Immediately below is the title justification box with left/bottom showing.
7. Click the down arrow next to left/bottom and highlight the word center
8. > ok. Doing this will center the source credibility label on the horizontal axis.
9. You should now have a figure of the results which looks like the top figure on the following page.

Bar Graph Instructions:

1. Follow the instructions above for creating a line graph. Then once the line graph is created do the following.
2. Double click on the figure. Doing this will put you into **Chart Editor** mode. Once you are in the Chart Editor mode then
3. > Series > Displayed > Bar (click on white circle) > Ok. This will produce a bar graph which looks like the bottom figure on the following page.
4. You can change the coloration of the bars, the fill pattern or the bar style by first clicking on them, and then clicking format and selection fill pattern, color, or bar style.



12
10
8
6
4
2
Mean Agreement Response
Low
High
Source Credibility



12
10
8
6
4
2
Mean Agreement Response
Low
High
Source Credibility

Matched Groups t-test (Repeated Measures t test)

As in the previous problem for the independent groups t-test, the researcher in the present problem was also interested in the issue of persuasion. However, this researcher was interested in finding out whether exposure to a newspaper article would influence the subjects' baseline attitudes toward the issue of gun control. What the researcher did was to measure the subjects' initial attitudes toward the topic of gun control using a 15 point scale that looked like that below:

pro gun control: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15: against gun control

Then the researcher gave to the subjects a newspaper article to read which pointed out a number of problems associated with unrestricted access to handguns. The thrust of the newspaper article appeared to be in favor of stricter gun control but the researcher wasn't sure, thus the researcher wanted to find out if reading the article was associated with an alteration of the subjects' attitudes toward the issue of gun control. After the subjects read the newspaper article the researcher re-administered the attitude scale and had the subjects respond a second time to the same attitude scale. The subjects baseline responses and their responses after reading the newspaper article are listed below. In this study each subject is responding to the same scale on two separate occasions.

Subject	Baseline Attitude	Attitude After Reading Article
1	12	8
2	11	10
3	11	9
4	10	9
5	10	6

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.

   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure
5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Baseline** (for baseline attitude).
6. Click on the white cell in **Row 1** under the word **Label** and type in **Baseline Attitude**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 2** under the word **Name** and type in the word **After** (for attitudes after reading article).
8. Click on the white cell in **Row 2** under the word **Label** and type in **After Reading Article**. (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

9. Click on the Data **View** tab in the lower left corner. The data view screen will now appear with column 1 named **Baseline** (for the Baseline attitude condition) and Column 2 will be named **After** (for the After Reading Article condition).

10. Enter data for all 5 subjects as follows. Click on the white cell at Row 1, Column 1 under **Baseline** and enter
12 tab 8 enter. Then mouse to the second row to enter the data for the second case.
11 tab 10 enter. Then mouse to the third row to enter the data for the third case etc.
11 tab 9 enter
10 tab 9 enter
10 tab 6 enter

> The data may also be entered down one column at a time, entering all the baseline data first, and then moving on to column 2 and entering the after article data.

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **compare means** then
   b. Click on **Paired Samples t-test**
2. Highlight the word **After** by clicking on it and then Highlight the word **baseline** by clicking on it
3. Click on the **arrow** > to transfer these names to the **Paired Variables Box**
4. Click on **OK**
5. Your results will appear in a Window. Scroll up using the slide bar on the right to the top of the output. The results of this analysis are presented below.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Baseline Attitude	10.8000	5	.83666	.37417
	After Reading Article	8.4000	5	1.51658	.67823

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Baseline Attitude & After Reading Article	5	.276	.653

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Baseline Attitude - After Reading Article	2.4000	1.51658	.67823	.5169	4.2831	3.539	4	.024

6. For the problem above the null and alternative hypothesis are spelled out below:

H_{null}: The mean score on the attitude scale prior to reading the newspaper article	will equal	the mean score on the attitude scale after reading the newspaper article
H_{alt}: The mean score on the attitude scale prior to reading the newspaper article	will not equal	the mean score on the attitude scale after reading the newspaper article.

7. **Interpretation and APA writing template for Result Above:**

Results indicate that the mean attitude score toward gun control after reading the newspaper article was 8.4 (M= 8.40, SD = .837), whereas the mean attitude score toward gun control prior to reading the newspaper article was 10.8 (M = 10.8, SD = 1.51). A two-tailed repeated measures t test performed on these differences indicated that the difference between these two means was significant $t(4) = 3.54$, $p < .05$. The results indicate that the null hypothesis of no difference should be rejected. Since lower scores imply a more favorable attitude toward the gun control issue, reading the newspaper article appears to be associated with a more favorable attitude toward gun control.

Graphics: Creating Line Graphs or Bar Charts

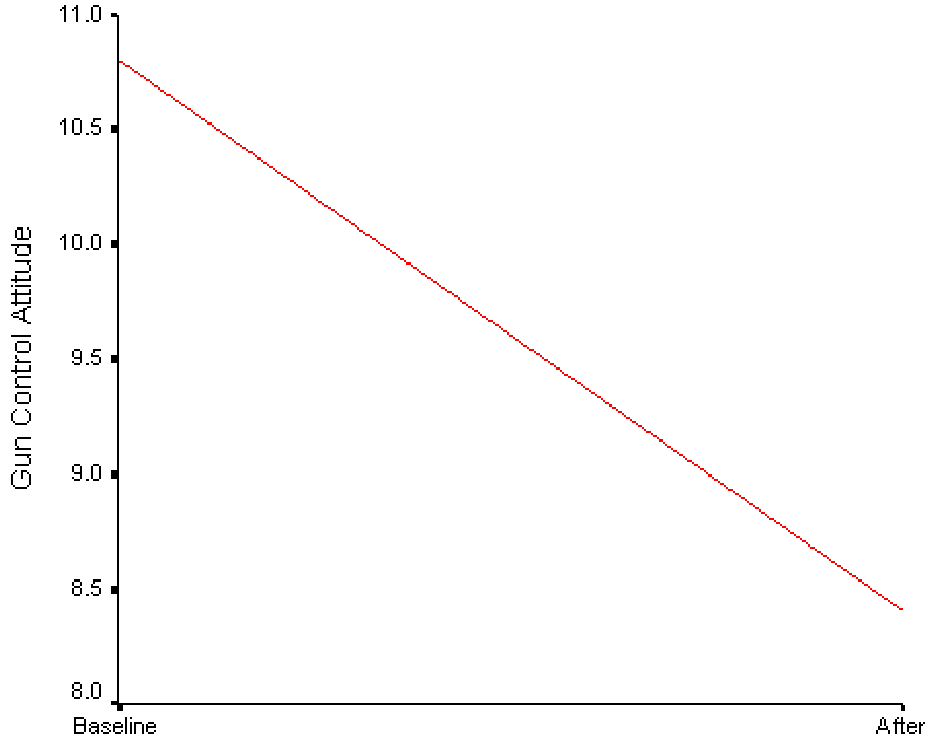
In the instructions that follow, the symbol > means to left click the word which follows the symbol. For example, > graph means to left click the word graph. To create a line graph for the results of the matched or repeated measures groups t test use the following instructions.

Line Graph Instructions:

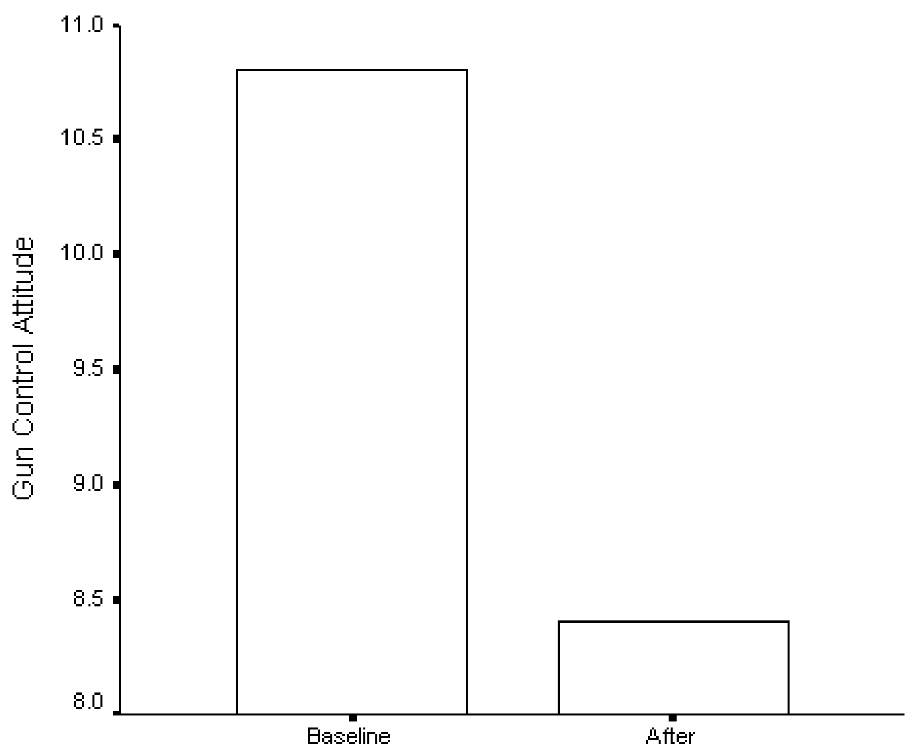
1. > Graph > Line > **Summaries of Separate Variables** > Simple > Define
2. Highlight Baseline then click right arrow to move Baseline to Line Represents Box
3. Highlight After then click right arrow to move after to Line Represents Box
4. > Ok
5. Double Click on Figure to bring up **Chart Editor** mode
6. > Chart > Axis > Ok
7. Highlight the word Mean adjacent to Axis title and type in Gun Control Attitude (name of dependent variable)
8. Click on Down Arrow next to Title Justification and click on center
9. > ok
10. > chart > inner frame. This will remove frame around figure.

Bar Graph Instructions

1. Follow the instructions above for creating a line graph. Then once the line graph is created do the following.
2. Double click on the figure. Doing this will put you into **Chart Editor** mode. Once you are in the Chart Editor mode then
3. > Series > Displayed > Bar (click on white circle) > Ok. This will produce a bar graph which looks like the bottom figure on the following page.
4. You can change the coloration of the bars, the fill pattern or the bar style by first clicking on them, and then clicking format and selection fill pattern, color, or bar style.



11.0
10.5
10.0
9.5
9.0
8.5
8.0
Gun Control Attitude
Baseline
After



11.0
10.5
10.0
9.5
9.0
8.5
8.0
Gun Control Attitude
Baseline
After

Pearson's Correlation

Similar to the researcher for the problem which called for an independent groups t test, the researcher in the present problem was also interested in the relationship between source credibility and the extent to which people agreed with the content of the message delivered by the speaker. However, the approach taken by the present researcher is different. In the present study the researcher does **NOT** randomly assign subjects to one of two source credibility conditions. Instead, the researcher in the present study had the subjects listen to a message delivered by a speaker and then asked the subjects to indicate the extent to which they agreed with the speaker on a 7 point agreement scale that looked like this:

low agreement: 1 2 3 4 5 6 7: high agreement

The researcher then had the subjects give their perceptions of the speaker's credibility by rating the speaker's credibility on a 7 point credibility scale that looked like this:

In my opinion the speaker has
low credibility: 1 2 3 4 5 6 7: high credibility

Finally, since the researcher was also interested in the relationship between the subject's intelligence and the extent to which they would agree with a speaker who delivered a message, the researcher also collected information on the subjects' intelligence by administering an I.Q. test. The results the researcher obtained were then put in a table like that below:

Subject	Extent of Agreement	Perceptions of Credibility	Subject's Intelligence
Hank	6	7	101
Bob	3	4	102
Sally	7	9	103
Sue	5	5	103
John	4	3	104
Ruth	2	1	105
Ron	3	2	106

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.

   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Agree** (for agreement).
6. Click on the white cell in **Row 1** under the word **Label** and type in **Extent of Agreement** (Doing this will provide you with more expansive labels in your results output).

7. Click on the white cell in **Row 2** under the word **Name** and type in **Credible** (for credibility).
8. Click on the white cell in **Row 2** under the word **Label** and type in **Credibility Perceptions** (Doing this will provide you with more expansive labels in your results output).
9. Click on the white cell in **Row 3** under the word **Name** and type in the word **IQ** (for intelligence).
10. Click on the white cell in **Row 3** under the word **Label** and type in **Subject's Intelligence**. (Doing this will provide you with more expansive labels in your results output).

DATA ENTRY PHASE

11. Click on the **Data View** tab in the lower left corner. The **data view** screen will now appear with Column 1 named **Agree** (for agreement), column 2 named **Credible** (for perceptions of credibility) and column 3 named **IQ** (for Subject's intelligence).
12. Enter the data for all 7 subjects as follows. Click on the white cell at Row 1, Column 1 under agree and enter:
    6 tab 7 tab 101 enter. Then mouse to the second row to enter the data for the second case.
    3 tab 4 tab 102 enter. Then mouse to the third row to enter the data for the third case etc. for the remaining cases.

    7 tab 9 tab 103
    5 tab 5 tab 103
    4 tab 3 tab 104
    2 tab 1 tab 105
    3 tab 2 tab 106

> The data may also be entered down one column at a time, entering all the agreement numbers first, and then moving on to column 2 and entering the credibility data, then moving on to column 3 and entering the intelligence data.

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **Correlate** then
   b. Click on **bi-variate**
2. Highlight the word **agree** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Variables** box
3. Highlight the word **credible** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Variables** box
4. Highlight the word **intell** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Variables** box
5. Make sure there is a check mark in the small white box next to the word **Pearson**. If not click on the small white box and a check mark should appear.
6. Click on **OK.**
7. Your results will appear in a Window. Scroll up using the slide bar on the right to the top of the output. The results of this analysis are presented below.

Correlations

		Extent of Agreement	Credibility Perceptions	Subject's Intelligence
Extent of Agreement	Pearson Correlation	1	.957**	-.585
	Sig. (2-tailed)	.	.001	.167
	N	7	7	7
Credibility Perceptions	Pearson Correlation	.957**	1	-.698
	Sig. (2-tailed)	.001	.	.081
	N	7	7	7
Subject's Intelligence	Pearson Correlation	-.585	-.698	1
	Sig. (2-tailed)	.167	.081	.
	N	7	7	7

**. Correlation is significant at the 0.01 level (2-tailed).

8. For the problem above the null and alternative hypotheses are spelled out below:

H_{null}: a) There is no relationship between agreement with the speaker's message and perceptions of the speaker's credibility.
b) There is no relationship between agreement with the speaker's message and the subject's intelligence score.
c) There is no relationship between perceptions of the speaker's credibility and the subject's intelligence score.

H_{alt}: a) There is a relationship between agreement with the speaker's message and perceptions of the speaker's credibility.
b) There is a relationship between agreement with the speaker's message and the subject's intelligence score.
c) There is a relationship between perceptions of the speaker's credibility and the subject's intelligence score.

9. **Interpretation and APA writing template for Results Above:**

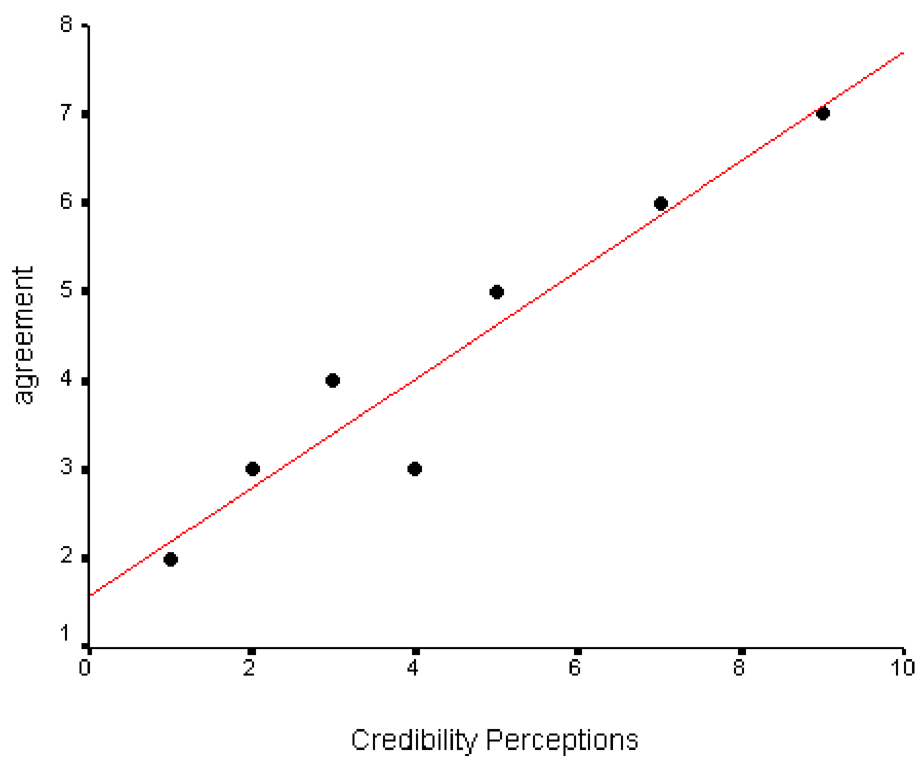
A series of Pearson correlations were calculated in order to determine the association among the variables. The participants' intelligence scores were not related to their perceptions of the speaker's credibility $r(5) = -.69$, $p > .05$. Similarly, the participants' intelligence scores were not related to their agreement with the speaker's message $r(5) = -.58$, $p > .05$. However, the participant's agreement with the speaker's message was positively related to their perceptions of the speaker's credibility $r(5) = .95$, $p < .05$.The more credibility the participants perceived the speaker as having, the more likely they were to agree with the speaker's message.

Graphics: Creating Scatterplots for Correlations

In the instructions that follow, the symbol > means to left click the word which follows the symbol. For example, > graph means to left click the word graph. To create a scatterplot for the results of a Pearson Correlation use the following instructions.

Scatterplot Instructions:

1. > Graph > Scatter > Simple > Define. At this point a simple scatterplot menu will appear.
2. Highlight the name of a variable you wish to consider as a dependent variable (e.g. agreement) and then click the right arrow to move it to the Y axis white box.
3. Highlight the name of a variable you wish to consider as a predictor variable e.g. (credibility perceptions) and then click the right arrow to move it to the X axis white box.
4. > Ok A scatterplot will now be created by SPSS.
5. Double click on the figure to bring up the **Chart Editor** mode.
6. > chart > options > white box under words **fit line** > ok
7. > chart > inner frame. This will remove frame around figure.
8. > chart > axis > ok > down arrow next to words left/bottom > center > ok
9. > chart > axis > white dot next to Y scale > ok > down arrow next to words left/bottom > center > ok



Spearman Rank Order Correlation

This test is used to determine if there is a correlation between sets of ranked data (ordinal data) or interval and ratio data that have been changed to ranks (ordinal data). Suppose some track athletes participated in three track and field events. In particular suppose they participated in two distance events (the mile and half mile) and one field event (shotput). Suppose a sports psychologist was interested in finding out if the finishing position of an athlete in the mile run was likely to be related to their finishing position in the half mile run and whether their placements in the running events were in any way related to their finishing position in the shotput field event. Thus, what the sports psychologist did was simply record the finishing position of each athlete in each event. Those finishing positions (ranked data) are listed for each athlete and each event in the table below.

Athlete	Mile	Halfmile	Shotput
A	4	3	7
B	9	8	6
C	3	5	8
D	6	7	1
E	7	9	2
F	1	2	9
G	8	6	4
H	5	4	5
I	2	1	3

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.

   Name Type Width Decimals **Label Values** Missing Columns Align Measure
5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Mile**.
6. Click on the white cell in **Row 2** under the word **Name** and type in the word **Halfmile**.
7. Click on the white cell in **Row 3** under the word **Name** and type in the word **Shotput**.

DATA ENTRY PHASE

8. Click on the **Data View** tab in the lower left corner. The **data view** screen will now appear with Column 1 named **Mile**, column 2 named **Halfmile** and column 3 named **Shotput**

9. Enter the data for Athletes A through I as follows. Click on the top left cell under the first column, **Mile**, and enter:
   4 tab 3 tab 7 enter. Then mouse to the second row to enter the data for athlete B.
   9 tab 8 tab 6 enter. Then mouse to the third row to enter the data for Athlete C. Follow the same procedure for the remaining athletes.

3 tab 5 tab 8
6 tab 7 tab 1
7 tab 9 tab 2
1 tab 2 tab 9
8 tab 6 tab 4
5 tab 4 tab 5
2 tab 1 tab 3

The data may also be entered down one column at a time, entering all the data for the mile first, and then moving on to column 2 and entering the halfmile data, then moving on to column 3 and entering the data for the shotput.

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **Correlate** then
   b. Click on **Bi-variate**
2. Highlight the word **mile** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Variables** box
3. Highlight the word **halfmile** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Variables** box
4. Highlight the word **shotput** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Variables** box.
5. Make sure there is a check mark in the small white box next to the word **Spearman** under Correlation Coefficients. If not, click on the small white box and a check mark should appear.
6. Click on **OK.**
7. Your results will appear in a Window. Scroll up using the slide bar on the right to the top of the output. The results of this analysis are presented below.

Correlations

			MILE	HALFMILE	SHOTPUT
Spearman's rho	MILE	Correlation Coefficient	1.000	.850**	-.450
		Sig. (2-tailed)	.	.004	.224
		N	9	9	9
	HALFMILE	Correlation Coefficient	.850**	1.000	-.433
		Sig. (2-tailed)	.004	.	.244
		N	9	9	9
	SHOTPUT	Correlation Coefficient	-.450	-.433	1.000
		Sig. (2-tailed)	.224	.244	.
		N	9	9	9

**. Correlation is significant at the .01 level (2-tailed).

8. Here are the null and alternative hypotheses for the above problem:

Hnull: a) There is no relationship between finishing position in the mile and half mile.
b) There is no relationship between finishing position in the mile and shotput.
c) There is no relationship between finishing position in the half mile and shotput.

Halt: a) There is a relationship between finishing position in the mile and half mile.
b) There is a relationship between finishing position in the mile and shotput.
c) There is a relationship between finishing position in the half mile and shotput.

9. **Interpretation and APA writing template for Results Above:**

A series of Spearman rank-order correlations were conducted in order to determine if there were any relationships between the finishing position of an athlete in the three events of the mile, the half mile, and the shotput. A two-tailed test of significance indicated the there was a significant positive relationship between the finishing position of athletes in the mile and half mile run $\underline{r}_s(9) = .85$, $\underline{p} < .05$. The better the athlete's performance in the mile run, the better their performance in the half mile run. However, a similar two tailed test of significance indicated that the athlete's finishing position in the mile run was unrelated to his finishing position in the shotput event $\underline{r}_s(9) = -.45$, $\underline{p} > .05$, and that his finishing position in the half mile was unrelated to his finishing position in the shotput event $\underline{r}_s(9) = -.4333$, $\underline{p} > .05$.

Simple Regression

For a simple (bivariate) linear regression problem, a researcher collects data for each participant in the study on an independent or predictor variable (X), and a dependent or criterion variable (Y). Simple linear regression evaluates how well a single independent (predictor) variable predicts a participant's response on a dependent (predicted) variable. If a linear relationship exists between two variables, regression methods utilize the existence of that relationship to predict the values of one variable (the predicted variable) from those of another (the predictor variable).

Suppose, for example, an admission's officer at a university is concerned about the methods that are being used to select students for entry into the university. In the past the university had been using student scores on the verbal section of the SAT as a predictor of likelihood of success while in college. The admissions officer was wondering whether this was a wise practice. The question of interest was whether success in college as measured by a student's college grade point average (GPA) could be predicted from knowledge of that student's score on the verbal section of the SAT. The admissions officer then took a random test sample of students who had recently graduated from the university and looked up their final college GPA as well as their entrance scores on the verbal section of the SAT which s/he had collected 4 years earlier. The admissions officer obtained the following information:

Student	**Verbal SAT Score**	**Final College GPA**
Jane	760	3.95
Bob	720	3.68
Rich	710	3.66
Laura	700	3.20
Karen	650	3.10
Randy	580	2.90
Jim	570	2.70
Paul	520	2.70
Glen	520	2.50
Bill	500	2.30
Mary	490	2.00

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2^{nd} option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.

   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **verbsat** (for Verbal SAT score).
6. Click on the white cell in **Row 1** under the word **Label** and type in **Verbal SAT**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 2** under the word **Name** and type in the word **colgpa** (for College GPA).

8. Click on the white cell in **Row 2** under the word **Label** and type in **College GPA**. (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

9. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **verbsat** (for the Verbal Sat variable) and Column 2 named **colgpa** (for the College GPA variable).
10. Enter data for cases 1 through 11 (Jane through Mary) as follows> Click on the top left cell under the first column **verbsat** and enter:
    760 tab 3.95 enter Then mouse to the second row to enter the data for the second case.
    720 tab 3.68 enter. Then mouse to the third row to enter the data for the third case etc. for the remaining cases
    710 tab 3.66 enter
    700 tab 3.20 enter
    650 tab 3.10 enter
    580 tab 2.90 enter
    570 tab 2.70 enter
    520 tab 2.70 enter
    520 tab 2.50 enter
    500 tab 2.30 enter
    490 tab 2.00 enter

> The data may also be entered down one column at a time, entering all the verbal sat data first, then moving on to column 2 and entering the data for college gpa.

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **Regression** then
   b. Click on **Linear**
2. Highlight **colgpa** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Dependent** Box
3. Highlight **verbsat** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Independent** Box
4. Underneath the Independent(s) box adjacent to the word **Method** should be the word **Enter**
   If not, then click on down arrow and select the method of Enter.
5. Click **Statistics button** toward the bottom of Linear Regression Screen then
   a. Click on White box next to **Model Fit** to place a check mark in it then
   b. Click on White box next to **Descriptives** to place a check mark in it
   c. Click on the **Continue** tab then
6. Click **OK**
7. You results will appear in a Window. Scroll up using the slide bar on the right to the top of the output. The results of this analysis are presented below.
8. Note that at step 5 above, adjacent to the **Statistics button** is a **Plot** button. You have an option at that point to select among many plot figures.

Correlations

		College GPA	Verbal SAT
Pearson Correlation	College GPA	1.000	.962
	Verbal SAT	.962	1.000
Sig. (1-tailed)	College GPA	.	.000
	Verbal SAT	.000	.
N	College GPA	11	11
	Verbal SAT	11	11

Descriptive Statistics

	Mean	Std. Deviation	N
College GPA	2.9718	.61415	11
Verbal SAT	610.9091	99.74513	11

Variables Entered/Removed [b]

Model	Variables Entered	Variables Removed	Method
1	Verbal SAT [a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: College GPA

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.962[a]	.926	.918	.17572

a. Predictors: (Constant), Verbal SAT

ANOVA [b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.494	1	3.494	113.147	.000[a]
	Residual	.278	9	.031		
	Total	3.772	10			

a. Predictors: (Constant), Verbal SAT

b. Dependent Variable: College GPA

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.648	.344		-1.883	.092
	Verbal SAT	5.926E-03	.001	.962	10.637	.000

a. Dependent Variable: College GPA

9. For the problem above the null and alternative hypotheses are spelled out below:

H_{null}: There is no linear relationship (or predictability) between verbal SAT score and college G PA

H_{alt}: There is a positive linear relationship between verbal SAT score and college GPA

10. **Interpretation and APA writing template for Results Above:**

A linear regression analysis was conducted on the bivariate data set to evaluate the prediction of college grade point average (GPA) from a student's score on the verbal component of the college SAT. The results indicate that there is a linear relationship between the two variables. As a student's score on the verbal section of the SAT increased, their overall GPA at the end of four years of college also tended to increase. The regression equation for predicting the college four year GPA is:

Predicted Four Year College GPA = .005926 Verbal SAT Score - .648

As expected students who scored well on the verbal component of the SAT tended to have higher GPAs at the end of four years of college. The correlation between Verbal SAT score and college GPA was $r(9) = +.962$, $p < .05$. Approximately 93% of the variance in the GPA scores was accounted for by its linear relationship with score on the verbal component of the SAT.

Partial Correlation

A partial correlation provides an index of whether two variables are linearly related (say score on the verbal section of the SAT and college grade point average) if the effects of a third (or more) control variable (say high school grade point average) are removed from their relationship. A partial correlation is a type of Pearson correlation coefficient that can range in value from -1 to +1. A significant positive partial correlation implies that as the values on one variable increase, the values on a second variable also tend to increase, **while holding constant the values of the control variable(s).**

Partial correlations are conducted in order to understand why two variables are correlated. In order to interpret a partial correlation between two variables, we will first need to know the size of the zero-order (bi-variate) correlation between the two variables.

Partial correlations assist in understanding regression. The simplest partial correlation involves only three variables, a predictor variable, a predicted variable, and a control variable. Suppose as in the previous problem (under regression) an admissions officer is interested in the relationship between a student's score on the verbal section of the SAT (the predictor variable) and the student's final grade point average while in college (the predicted variable). However, suppose high school GPA is correlated with both college GPA and verbal SAT score. Would there still be a meaningful correlation between verbal SAT score and college GPA if we controlled for performance while in high school? Will the removal of high school GPA lessen the relationship between verbal SAT and college GPA?

Suppose the admissions officer in the previous problem, under simple regression, believed that the reason verbal SAT scores and College GPA are related is that they share a common denominator - namely how the student applied themselves while in high school. If correct, there should be a correlation between verbal SAT and college GPA but the correlation between these two variables partialling out the effects of high school performance should approach zero. The admissions officer obtained the following information:

Student	**Verbal SAT**	**College GPA**	**High School GPA**
Jane	760	3.95	98
Bob	720	3.68	95
Rich	710	3.66	94
Laura	700	3.20	92
Karen	650	3.10	90
Randy	580	2.90	88
Jim	570	2.70	85
Paul	520	2.70	82
Glen	520	2.50	80
Bill	500	2.30	78
Mary	490	2.00	70

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2^{nd} option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.

   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **verbsat** (for Verbal SAT score).
6. Click on the white cell in **Row 1** under the word **Label** and type in **Verbal SAT**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 2** under the word **Name** and type in the word **colgpa** (for College GPA).
8. Click on the white cell in **Row 2** under the word **Label** and type in **College GPA**. (Doing this will provide you with a more expansive label in the results output).
9. Click on the white cell in **Row 3** under the word **Name** and type in **hsgpa** (for high school GPA).
10. Click on the white cell in **Row 3** under the word **Label** and type in **high school gpa** (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

11. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **verbsat** (for the Verbal Sat variable) and Column 2 named **colgpa** (for the College GPA variable) and Column 3 named **hsgpa** (for the High School GPA variable)..

10. Enter data the data for the 11 students (Jane through Mary) as follows> Click on the top left cell under the first column **verbsat** and enter:

760 tab 3.95 tab 98 enter
720 tab 3.68 tab 95 enter

Then mouse to second row to enter the data for the second case.
Then mouse to the third row to enter the data for the third case etc. for the remaining cases.

710 tab 3.66 tab 94 enter
700 tab 3.20 tab 92 enter
650 tab 3.10 tab 90 enter
580 tab 2.90 tab 88 enter
570 tab 2.70 tab 85 enter
520 tab 2.70 tab 82 enter
520 tab 2.50 tab 80 enter
500 tab 2.30 tab 78 enter
490 tab 2.00 tab 70 enter

> The data may also be entered down one column at a time, entering all the verbsat data, then moving on to column 2 and entering the data for the college gpa, and then on to column 3 and entering the data for the high school gpa.

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **Correlate** then
   b. Click on **Partial**
2. Highlight **colgpa** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Variable** Box
3. Highlight **verbsat** by clicking on it and then
   a. Click on **arrow >** to also transfer this name to the **Variable** Box
4. Highlight **hsgpa** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Controlling For** Box
5. Click **Options** Button then

a. Click white box adjacent to means and standard deviations (This will result in a check mark in the box) then

b. Click white box adjacent to zero-order correlations (This will result in a check mark in the box) then

c. Click **continue**

6. Click **OK**

7. Your results will appear in a Window. Scroll up using the slide bar on the right to the top of the output. The results of this analysis are presented below.

```
Variable            Mean     Standard Dev     Cases

COLGPA            2.9718             .6141        11
VERBSAT         610.9091           99.7451        11
HSGPA            86.5455            8.4542        11


- - -  P A R T I A L   C O R R E L A T I O N   C O E F F I C I E N T S  - - -

Zero Order Partials

              COLGPA    VERBSAT     HSGPA

COLGPA        1.0000      .9625      .9720
             (    0)    (    9)    (    9)
             P= .       P= .000    P= .000

VERBSAT        .9625     1.0000      .9445
             (    9)    (    0)    (    9)
             P= .000    P= .       P= .000

HSGPA          .9720      .9445     1.0000
             (    9)    (    9)    (    0)
             P= .000    P= .000    P= .

(Coefficient / (D.F.) / 2-tailed Significance)


- - -  P A R T I A L   C O R R E L A T I O N   C O E F F I C I E N T S  - - -

Controlling for..    HSGPA

              COLGPA    VERBSAT

COLGPA        1.0000      .5751
             (    0)    (    8)
             P= .       P= .082

VERBSAT        .5751     1.0000
             (    8)    (    0)
             P= .082    P= .

(Coefficient / (D.F.) / 2-tailed Significance)
```

8. For the problem above the null and alternative hypotheses are spelled out below:

H_{null}: When controlling for high school gpa, there is no relationship between verbal SAT score and college GPA

H_{alt}: When controlling for high school gpa, there is a relationship between verbal SAT score and college GPA.

9. **Interpretation and APA writing template for Results Above:**

Pearson correlation coefficients were computed among the three variables of verbal SAT scores, college GPA, and high school GPA. The results of these correlational analyses indicated that all three variables were positively correlated with one another. The bi-variate correlation between verbal SAT scores and college GPA was $\underline{r}$ (9) = .9625, $\underline{p}$ < .05, and the bi-variate correlation between high school GPA and verbal SAT scores was $\underline{r}$ (9) = .9445, $\underline{p}$ < .05. Finally, the bi-variate correlation between high school GPA and college GPA was $\underline{r}$ (9) = .9720, $\underline{p}$ <.05. A partial correlation was then computed between verbal SAT scores and college GPA, holding constant or controlling for high school GPA. If high school GPA is the principle determinant of college GPA, the partial correlation between verbal SAT and college GPA should not be significant. The results suggest that verbal SAT scores are unrelated to college GPA, $\underline{r}$ (8) = .5751, $\underline{p}$ > .05, when controlling for high school GPA scores.

Multiple Regression

Multiple regression is an extension of simple (bi-variate) regression. The goal of multiple regression is to enable a researcher to assess the relationship between a dependent (predicted) variable and several independent (predictor) variables. The end result of multiple regression is the development of a regression equation (line of best fit) between the dependent variable and several independent variables.

There are several types of multiple regression analyses (e.g. standard, hierarchical, setwise, stepwise) only two of which will be presented here (standard and stepwise). Which type of analysis is conducted depends on the question of interest to the researcher.

Suppose, for example, a college admissions officer was interested in using verbal SAT scores and high school grade point averages (as independent or predictor variables) to predict college grade point averages (as a dependent or predicted variable).

Standard multiple regression would be used to address a couple of questions: a) what is the size of the overall relationship between college GPA (the predicted variable) and the independent (predictor) variables of verbal SAT scores and high school GPA?; and b) how much does **each** independent (predictor) variable uniquely contributed to that relationship? In **standard** multiple regression **all** predictor variables are entered into the regression equation at once.

Stepwise multiple regression would be used to answer a different question. The focus of **stepwise** regression would be the question of what the best combination of independent (predictor) variables would be to predict the dependent (predicted) variable, e.g. college GPA. In **stepwise** regression **not all** independent (predictor) variables, e.g. high school GPA and verbal SAT scores, may end up in the equation.

In a **stepwise** regression, predictor variables are entered into the regression equation **one at a time** based upon statistical criteria. At each step in the analysis the predictor variable that contributes the most to the prediction equation in terms of increasing the multiple correlation, R, is entered first. This process is continued only if additional variables add anything statistically to the regression equation. When no additional predictor variables add anything statistically meaningful to the regression equation, the analysis stops. Thus, **not all** predictor variables may enter the equation in **stepwise** regression. Listed below are the verbal SAT scores, college GPAs, and high school GPAs collected on 11 students by an admissions officer.

Student	**Verbal SAT**	**College GPA**	**High School GPA**
Jane	760	3.95	98
Bob	720	3.68	95
Rich	710	3.66	94
Laura	700	3.20	92
Karen	650	3.10	90
Randy	580	2.90	88
Jim	570	2.70	85
Paul	520	2.70	82
Glen	520	2.50	80
Bill	500	2.30	78
Mary	490	2.00	70

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.

   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **verbsat** (for Verbal SAT score).
6. Click on the white cell in **Row 1** under the word **Label** and type in **Verbal SAT**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 2** under the word **Name** and type in the word **colgpa** (for College GPA).
8. Click on the white cell in **Row 2** under the word **Label** and type in **College GPA**. (Doing this will provide you with a more expansive label in the results output).
9. Click on the white cell in **Row 3** under the word **Name** and type in **hsgpa** (for high school GPA).
10. Click on the white cell in **Row 3** under the word **Label** and type in **high school gpa** (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

11. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **verbsat** (for the Verbal Sat variable) and Column 2 named **colgpa** (for the College GPA variable) and Column 3 named **hsgpa** (for the High School GPA variable)..

10. Enter data the data for the 11 students (Jane through Mary) as follows> Click on the top left cell under the first column **verbsat** and enter:

760 tab 3.95 tab 98 enter
720 tab 3.68 tab 95 enter

Then mouse to second row to enter the data for the second case.
Then mouse to the third row to enter the data for the third case etc. for the remaining cases.

710 tab 3.66 tab 94 enter
700 tab 3.20 tab 92 enter
650 tab 3.10 tab 90 enter
580 tab 2.90 tab 88 enter
570 tab 2.70 tab 85 enter
520 tab 2.70 tab 82 enter
520 tab 2.50 tab 80 enter
500 tab 2.30 tab 78 enter
490 tab 2.00 tab 70 enter

The data may also be entered down one column at a time, entering all the verbsat data, then moving on to column 2 and entering the data for the college gpa, and then on to column 3 and entering the data for the high school gpa.

Data Analysis

1. Click on **Analyze** at top of the screen then
   a. Click on **Regression** then
   b. Click on **Linear**
2. Highlight **colgpa** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Dependent** Box
3. Highlight **verbsat** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Independent(s)** Box
4. Highlight **hsgpa** by clicking on it and then

a. Click on **arrow >** to transfer this name to the **Independent (s)** Box

5. Click on **Down arrow** adjacent to the **Method** Box and then
   a. Click on **Enter**
6. Click on **OK**
7. Your results will appear in a Window. Scroll up using the slide bar on the right to the top of the output. The **key** results of this analysis are presented below. **There are other important tables which may appear on your screen that are NOT reproduced below.**

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.981[a]	.963	.954	.13190

a. Predictors: (Constant), High School GPA, Verbal SAT

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.633	2	1.816	104.395	.000[a]
	Residual	.139	8	.017		
	Total	3.772	10			

a. Predictors: (Constant), High School GPA, Verbal SAT

b. Dependent Variable: College GPA

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.245	.622		-3.611	.007
	Verbal SAT	2.531E-03	.001	.411	1.989	.082
	High School GPA	4.241E-02	.015	.584	2.824	.022

a. Dependent Variable: College GPA

8. **Interpretation and APA writing template for the Standard Multiple Regression Results Above:**

A standard multiple regression analysis was conducted to evaluate how well high school grade point average and verbal SAT scores predicted college GPA. The linear combination of high school GPA and verbal SAT scores was significantly related to college GPA, $F((2,8) = 104.395$, $p < .001$. The multiple correlation coefficient was .98, indicating that approximately 96% of the variance of the college GPA can be accounted for by the linear combination of high school GPA and verbal SAT scores. The regression equation for predicting the college GPA was:

Predicted College GPA = .042406 x high school GPA + .002531 x Verbal SAT Score -2.244615

Data Analysis for a Stepwise Regression

1. Click on **Analyze** at top of the screen then
   a. Click on **Regression** then
   b. Click on **Linear**
2. Highlight **colgpa** by clicking on it and then
   a. Click on **arrow** > to transfer this name to the **Dependent** Box
3. Highlight **verbsat** by clicking on it and then
   a. Click on **arrow** > to transfer this name to the **Independent(s)** Box
4. Highlight hsgpa by clicking on it and then
   a. Click on **arrow** > to transfer this name to the **Independent (s)** Box
5. Click on **Down arrow** adjacent to the **Method** Box and then
   a. Click on **Stepwise**
6. Click on **OK**
7. Your results will appear in a Window. Scroll up using the slide bar on the right to the top of the output. The **key** results of this analysis are presented below. **There are other important tables which may appear on your screen that are NOT reproduced below.**

Variables Entered/Removed [a]

Model	Variables Entered	Variables Removed	Method
1	high school gpa	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: College GPA

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.972[a]	.945	.939	.1520

a. Predictors: (Constant), high school gpa

ANOVA [b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.564	1	3.564	154.212	.000[a]
	Residual	.208	9	2.311E-02		
	Total	3.772	10			

a. Predictors: (Constant), high school gpa

b. Dependent Variable: College GPA

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-3.139	.494		-6.352	.000
	High School GPA	7.061E-02	.006	.972	12.418	.000

a. Dependent Variable: College GPA

Excluded Variables[b]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	Verbal SAT	.411[a]	1.989	.082	.575	.108

a. Predictors in the Model: (Constant), High School GPA

b. Dependent Variable: College GPA

8. **Interpretation and APA writing template for the Stepwise Multiple Regression Results Above:**

A stepwise multiple regression was conducted to evaluate whether **both** high school grade point average and verbal SAT scores were necessary to predict college GPA. At step 1 of the analysis high school GPA entered into the regression equation and was significantly related to college GPA $\underline{F}$ (1,9) = 154.21, $\underline{p}$ < .001. The multiple correlation coefficient was .97, indicating approximately 94.5% of the variance of the college GPA could be accounted for by high school GPA scores. Verbal SAT scores did not enter into the equation at step 2 of the analysis (t = 1.989, $\underline{p}$ > .05). Thus the regression equation for predicting college GPA was:

Predicted College GPA = .0706 x high school GPA - 3.139

Oneway Analysis of Variance

The present problem is similar to that on page 4, which called for an independent groups t test. On page 1 the researcher was interested in finding out whether source credibility influenced agreement with the speaker. However, in that problem there were only **two** variations of source credibility (high and low). For the present problem there are **more than two** variations of source credibility. **When there are more than two variations of the independent variable the independent groups t test becomes inappropriate**. In the present problem, the researcher was interested in finding out if people would be more likely to agree to the content of a message when that message was delivered to them by a high credible source than when that same message was presented by either a low credible source or by a source whose credibility was left unspecified. The researcher first composed a message about some of the unintended negative side effects of brushing one's teeth after each and every meal. Then the researcher went into a classroom to distribute the message in written form to all of the students in class. There were, however, **three** variations of the sheet of paper that the researcher randomly distributed around the room. For one third of the students, at the top of the sheet of paper was some information that the author of the message was a former dentist who had been convicted of medical quackery (**low credible** source condition). For another one third of the students, the information at the top of the sheet of paper indicated that the author of the message was a dentist who was the current president of the American Dental Association, chairman of the department of a prominent dental school, and a scholar who had also published a number of research articles in scholarly journals (**high credible** source condition). For the remaining one third of the students, there was no information about the source of the message (**neutral** credible source condition). After reading the message the students were asked to circle a number on a twenty -point scale, which indicated the extent to which they agreed with the position being advocated by the author of the message. The scale looked like the following:

disagree with speaker: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20: agree with speaker

The responses of the students in each of the conditions of the experiment are listed in the table below:

Low Credible Source	**Neutral Credible Source**	**High Credible Source**
3	4	12
4	6	14
5	8	16

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.

   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Source** (for source credibility).
6. Click on the white cell in **Row 1** under the word **Label** and type in **Source Credibility**. (Doing this will

provide you with a more expansive label for your independent variable in the results output).

7. Click on the white cell in **Row 1** under the word **Value**. The word none will appear along with a small grey box to the right.
    a. Click on the small grey box and a Value Labels window will appear
    b. In the white box next to the word **Value**, type in the number **1**
    c. Click on the white box next to the word **Value Label** and type **Low Credibility** (for Low credible source).
    d. Click on the **Add** button. 1 = "**Low**" should now appear in the bottom white box.
    e. In the white box next to the word **Value** type in the number **2**
    f. Click on the white box next to the word **Value Label** and type **Neutral Credibility** (for Neutral credible source).
    g. Click on the **Add** button. 2 = "neutral" should now also appear in the bottom white box.
    h. In the white box next to the word **Value** type in the number **3**
    i. Click on the white box next to the word **Value Label** and type **High Credibility** (for High credible source).
    j. Click on the **Add** button. 3 = "High" should now also appear in the bottom white box.
    k. Click **Ok**
8. Click on the white cell in **Row 2** under the word **Name** and type in the word **Agree** (for Agreement)
9. Click on the white cell in **Row 2** under the word **Label** and type in **Agreement** (for agreement) (Doing this will provide you with a more expansive label for your results output).

DATA ENTRY PHASE

10. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Source** (for the source credibility independent variable) and Column 2 named **Agree** (for the agreement dependent variable).
11. Enter data for all ten subjects as follows. Click on the white cell at Row 1 Column 1 under Source and enter

1 tab 3 enter. Then mouse to the second row to enter the data for the second case.
1 tab 4 enter. Then mouse to the third row to enter the data for the third case.
1 tab 5 enter
2 tab 4 enter
2 tab 6 enter
2 tab 8 enter
3 tab 12 enter
3 tab 14 enter
3 tab 16 enter

> The data may also be entered down one column at a time, entering the codes for source, where 1 means low, 2 means neutral credible source and 3 mean high credible source. Then move on to column 2 and enter the responses on the agreement scale.

1. Click on **Analyze** at top of the screen then
    a. Click on **Compare Means** then
    b. Click on **One-way ANOVA**
2. Highlight **agree** by clicking on it and then
    a. Click on **arrow >** to transfer this name to the **Dependent** List Box
3. Highlight **source** by clicking on it and then
    a. Click the lower **arrow >** to transfer this name to the **Factor** Box
4. Click on the **Post Hoc** button then
    a. Click on the white square next to **Tukey** (A check mark should appear)
    b. Click on **Continue** button

5. Click on the **Options** button then
    a. Click on white square next to **Descriptives** (A check mark should appear)
    b. Click on **Continue** button
6. Click **OK**
7. Your results will appear in a Window. Scroll up using the slide bar on the right to the top of the output. The results of this analysis are presented below.

Descriptives

Agreement

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Low	3	4.0000	1.00000	.57735	1.5159	6.4841	3.00	5.00
Neutral	3	6.0000	2.00000	1.15470	1.0317	10.9683	4.00	8.00
High	3	14.0000	2.00000	1.15470	9.0317	18.9683	12.00	16.00
Total	9	8.0000	4.82183	1.60728	4.2936	11.7064	3.00	16.00

ANOVA

Agreement

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	168.000	2	84.000	28.000	.001
Within Groups	18.000	6	3.000		
Total	186.000	8			

Multiple Comparisons

Dependent Variable: Agreement

Tukey HSD

(I) Source Credibility	(J) Source Credibility	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Low	Neutral	-2.0000	1.41421	.392	-6.3392	2.3392
	High	-10.0000*	1.41421	.001	-14.3392	-5.6608
Neutral	Low	2.0000	1.41421	.392	-2.3392	6.3392
	High	-8.0000*	1.41421	.003	-12.3392	-3.6608
High	Low	10.0000*	1.41421	.001	5.6608	14.3392
	Neutral	8.0000*	1.41421	.003	3.6608	12.3392

*. The mean difference is significant at the .05 level.

Agreement

Tukey HSD [a]

Source Credibility	N	Subset for alpha = .05	
		1	2
Low	3	4.0000	
Neutral	3	6.0000	
High	3		14.0000
Sig.		.392	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3.000.

8. For the problem above the null and alternative hypothesis are spelled out below:

H_{null}: Source credibility does not affect agreement.

H_{alt}: Source credibility does affect agreement.

9. **Interpretation and APA writing template for Result Above:**

A one-way analysis of variance was conducted to determine whether source credibility influenced the extent to which participants in the study agreed with the position being advocated by the author of the message. Results of that analysis indicated that the null hypothesis should be rejected and that source credibility had a significant effect on the extent to which participants agreed with the message, F (2,6) = 28.00, $p < .05$. A Tukey test was conducted to determine which specific groups differed from one another. Results of that analysis indicate that the low credible (M = 4.00, SD = 1.00) and neutral credible (M = 6.00, SD = 2.00) source conditions did not differ from one another. However, the high credible source produced significantly more agreement (M = 14.00, SD = 2.00) than either the neutral or low credible source conditions, $p < .05$.

Multiple Comparisons

Dependent Variable: Agreement
Tukey HSD

(I) Source Credibility	(J) Source Credibility	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Low	Neutral	-2.0000	1.41421	.392	-6.3392	2.3392
	High	-10.0000*	1.41421	.001	-14.3392	-5.6608
Neutral	Low	2.0000	1.41421	.392	-2.3392	6.3392
	High	-8.0000*	1.41421	.000	-12.3392	-3.6608
High	Low	10.0000*	1.41421	.001	5.6608	14.3392
	Neutral	8.0000*	1.41421	.003	3.6608	12.3392

* The mean difference is significant at the .05 level.

Agreement

Tukey HSD[a]

Source Credibility	N	Subset for alpha = .05	
		1	2
Low	3	4.0000	
Neutral	3	6.0000	
High	3		14.0000
Sig.		.392	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3.000.

8. For the problem above the null and alternative hypothesis are spelled out below:
   H_{null}: Source credibility does not affect agreement.
   H_{alt}: Source credibility does affect agreement.
9. **Interpretation and APA writing template for Result Above:**

A one-way analysis of variance was conducted to determine whether source credibility influenced the extent to which participants in the study agreed with the position being advocated by the author of the message. Results of that analysis indicated that the null hypothesis should be rejected and that source credibility had a significant effect on the extent to which participants agreed with the message, $\underline{F}\ (2,6) = 28.00$, $\underline{p} < .05$. A Tukey test was conducted to determine which specific groups differed from one another. Results of that analysis indicate that the low credible (M = 4.00, SD = 1.00) and neutral credible (M = 6.00, SD = 2.00) source conditions did not differ from one another. However, the high credible source produced significantly more agreement (M = 14.00, SD = 2.00) than either the neutral or low credible source conditions, $p < .05$.

Repeated Measures Oneway ANOVA

For this problem a social psychological researcher working for an advertising firm was interested in finding out if frequency of exposure to a stimulus would influence one's liking for the stimulus. The researcher was of the opinion that a person's liking for a stimulus would increase the more frequently the person was exposed to the stimulus. To find out if this was true the researcher exposed a group of people to a test commercial and then asked them to indicate how much they liked the test commercial after they had seen it for the first time, then again after they had seen it five times, and then again after they had seen it ten times. The people indicated their liking for the test commercial on a 15 point liking scale that looked like that below:

low liking: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15: high liking

The researcher recorded each person's responses in a table which looked like that below:

Levels of Independent Variable (Frequency of Exposure)

Subject	**Once**	**Five Times**	**Ten Times**
John	2	4	9
Mary	3	6	9
Frank	2	5	8
Sue	4	8	12
Ron	1	6	8
Jane	4	5	7

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.

   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Once** (for One Time).
6. Click on the white cell in **Row 1** under the word **Label** and type in the words **One Time**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 2** under the word **Name** and type in the word **Five** (for Five Times).
8. Click on the white cell in **Row 2** under the word **Label** and type in the words **Five Times**. (Doing this will provide you with a more expansive label in the results output).
9. Click on the white cell in **Row 3** under the word **Name** and type in the word **Ten** (for Ten Times).
10. Click on the white cell in **Row 3** under the word **Label** and type in the words **Ten Times**. (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

11. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Once** (for one time) , Column 2 named **Five** (for five times), and Column 3 named **Ten** (for ten times.)
12. Enter the data for the six cases (John through Jane) as follows: Click on the top left cell under the first column **Once** and enter:

2 tab	4 tab	9 enter
3 tab	6 tab	9 enter
2 tab	5 tab	8 enter
4 tab	8 tab	12 enter
1 tab	6 tab	8 enter
4 tab	5 tab	7 enter

Then mouse to the second row to enter the data for the second case. Then mouse to the third row to enter the data for the third case etc. for the remaining cases.

> The data may also be entered down one column at a time, entering all the numbers for the "once" condition, then moving on to column 2 and entering the numbers for the "five times" condition and then moving on to column 3 and entering the numbers for the "ten times" condition.

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **General Linear Model** then
   b. Click on **GLM-Repeated Measures**
2. Highlight the word **factor1** in the **within-subjects factor** name box then
   a. Type in **Times** (This is a short name for the independent variable, number of times commercial was seen, and is limited to eight characters), then
   b. Click in white square next to **Number of Levels** and enter the number **3** (since there are 3 levels of the independent variable) then
   c. Click on the **Add** button
3. Click on the **Define** button then
   a. Highlight the word **Once** by clicking on it then
   b. Click on the **arrow >** to move this into the **within subjects variable** box at "level 1" of the within subjects variable box then
   c. Highlight the word **Five** by clicking on it then
   d. Click on the **arrow >** to move this into the **within subjects variable** box at "level 2" of the within subjects variable box then
   e. Highlight the word **Ten** by clicking on it then
   f. Click on the **arrow >** to move this into the **within subjects variable** box at "level 3" of the within subjects variable box
4. Click on **Options** button then
   a. Click in white box next to **Descriptive Statistics** (A check mark should appear) then
   b. Click **Continue** button
5. Click **OK**
6. Your results will appear in a Window. Scroll up using the slide bar on the right to the top of the output. The results of this analysis are presented below.

Descriptive Statistics

	Mean	Std. Deviation	N
ONCE	2.6667	1.21106	6
Five Times	5.6667	1.36626	6
Ten Times	8.8333	1.72240	6

Multivariate Tests [b]

Effect		Value	F	Hypothesis df	Error df	Sig.
TIMES	Pillai's Trace	.942	32.218[a]	2.000	4.000	.003
	Wilks' Lambda	.058	32.218[a]	2.000	4.000	.003
	Hotelling's Trace	16.109	32.218[a]	2.000	4.000	.003
	Roy's Largest Root	16.109	32.218[a]	2.000	4.000	.003

a. Exact statistic

b.
Design: Intercept
Within Subjects Design: TIMES

Mauchly's Test of Sphericity[b]

Measure: MEASURE_1

					Epsilon[a]		
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Greenhouse-Geisser	Huynh-Feldt	Lower-bound
TIMES	.806	.864	2	.648	.837	1.000	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

b.
Design: Intercept
Within Subjects Design: TIMES

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
TIMES	Sphericity Assumed	114.111	2	57.056	54.053	.000
	Greenhouse-Geisser	114.111	1.675	68.138	54.053	.000
	Huynh-Feldt	114.111	2.000	57.056	54.053	.000
	Lower-bound	114.111	1.000	114.111	54.053	.001
Error(TIMES)	Sphericity Assumed	10.556	10	1.056		
	Greenhouse-Geisser	10.556	8.374	1.261		
	Huynh-Feldt	10.556	10.000	1.056		
	Lower-bound	10.556	5.000	2.111		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	TIMES	Type III Sum of Squares	df	Mean Square	F	Sig.
TIMES	Linear	114.083	1	114.083	76.910	.000
	Quadratic	2.778E-02	1	2.778E-02	.044	.842
Error(TIMES)	Linear	7.417	5	1.483		
	Quadratic	3.139	5	.628		

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	589.389	1	589.389	140.703	.000
Error	20.944	5	4.189		

7. For the problem above the null and alternative hypotheses are spelled out below:

H_{null}: a) The mean liking evaluations at all three times will be equal

H_{alt}: b) The mean liking evaluations at all three times will not be equal

8. **Interpretation and APA writing template for Result Above**

A one way repeated measures analysis of variance was conducted to determine whether frequency of exposure to a stimulus (once, five times or ten times) influenced a person's liking evaluation of that stimulus. Results of the analysis indicated that the null hypothesis of equality among means should be rejected, and that the frequency of exposure to a stimulus significantly influenced the liking evaluation of that stimulus, $\underline{F}$ (2,10) = 54.05, $\underline{p} < .05$. The means and standard deviations of liking evaluations for the stimulus after having seen it once, five times, or ten times were respectively ($\underline{M}$ = 2.667, $\underline{SD}$ = 1.211), ($\underline{M}$ = 5.667, SD = 1.366), and ($\underline{M}$ = 8.833, $\underline{SD}$ = 1.722). A post ANOVA Tukey test indicated that all three means differed significantly from one another, $\underline{p} < .05$. More frequent exposure to the stimulus was associated with greater liking for that stimulus.

Twoway Analysis of Variance

Unlike previous problems in the manual, the present problem involves **two independent variables** (gender of juror and type of crime committed by defendant). There are two **levels** of gender of juror (male and female), and **three** levels of type of crime (assault, robbery, and rape). The dependent variable (sentence) is ratio scale data. Hence the present problem calls for a **2 x 3 twoway** analysis of variance. The researcher was a law psychologist who was interested in whether people administered harsher or light sentences to defendants convicted of one of three types of crimes (assault, robbery, or rape). S/he felt they would but didn't have any opinion as to which crime would receive the harshest sentence. The researcher also wanted to find out whether the gender of the juror would influence the length of sentence administered to a defendant and more specifically whether the gender of the juror would "interact" with the type of crime being processed. Specifically, the researcher felt that gender of juror was likely to be **un**important when trying a defendant for assault or robbery but felt that gender of juror would be important for the charge of rape. To test out their idea the researcher **randomly** assigned 9 female jurors to read one of three cases (3 **different** jurors per case). They read a case about either an assault, a robbery, or a rape. After reading the case the jurors were asked to assign a prison term (from 1 to 25 years of imprisonment) to the defendant for their crime. The researcher also followed the same procedure for a group of 9 male jurors. The males were also randomly assigned to read one of the three cases (3 **different** jurors per case). The researcher came up with the following number of years of imprisonment assigned by the jurors in each of the 6 conditions of the experiment.

	Column 1 **Assault**	**Column 2** **Robbery**	**Column 3** **Rape**
Female Jurors (Row 1 of gender)	4 6 8	5 3 7	12 11 13
Male Jurors (Row 2 of gender)	8 6 4	7 3 5	1 2 3

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.
   Name Type Width Decimals **Label Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Gender**
6. Click on the white cell in **Row 1** under the word **Label** and type in **Juror Gender**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 1** under the word **Value**. The word none will appear along with a small grey

box to the right.

a. Click on the small grey box and a Value Labels window will appear
b. In the white box next to the word **Value**, type in the number **1**
c. Click on the white box next to the word **Value Label** and type **Female** (for female jurors)
d. Click the **Add** button. 1 = "**Female**" should now appear in the bottom white box.
e. In the white box next to the word **Value** type in the number **2.**
f. Click on the white box next to the word **Value Label** and type **Male** (for Male jurors).
g. Click the **Add** button. 2 = "**Male**" should now appear in the bottom white box also.
h. Click **OK**

8. Click on the white cell in **Row 2** under the word **Name**. Type in the word **Crime**
9. Click on the white cell in **Row 2** under the word **Label** and type in **Crime Type** (Doing this will provide you with a more expansive label in the results output).
10. Click on the white cell in **Row 2** under the word **Value**. The word none will appear along with a small grey box to the right.
    a. Click on the small grey box and a Value Labels window will appear
    b. In the white box next to the word **Value**, type in the number **1**
    c. Click on the white box next to the word **Value Label** and type **Assault**
    d. Click on the **Add** button. 1 = "**Assault**" should now appear in the bottom white box.
    e. In the white box next to the word **Value** type in the number **2.**
    f. Click on the white box next to the word **Value Label** and type **Robbery**
    g. Click the **Add** button. 2 = "**Robbery**" should now appear in the bottom white box also.
    h. In the white box next to the word **Value** type in the number **3.**
    i. Click on the white box next to the word **Value Label** and type **Rape**
    j. Click the **Add** button. 3 = "**Rape**" should now appear in the bottom white box also.
    k. Click **OK**
11. Click on the white cell in **Row 3** under the word **Name**. Type in the word **Sentence**.

DATA ENTRY PHASE

12. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Gender** (for juror gender), Column 2 name **Crime** (for the type of crime) and Column 3 named **Sentence** (for the Sentence dependent variable).
13. Enter the data for the eighteen cases as follows: Click on the top left cell under the first column **Gender** and enter:

1 tab	1 tab	4 enter	Then mouse to the second row to enter the data for the second case.
1 tab	1 tab	6 enter	Then mouse to the third row to enter the data for the third case etc. for the remaining cases.
1 tab	1 tab	8 enter	
2 tab	1 tab	8 enter	
2 tab	1 tab	6 enter	
2 tab	1 tab	4 enter	
1 tab	2 tab	5 enter	
1 tab	2 tab	3 enter	
1 tab	2 tab	7 enter	
2 tab	2 tab	7 enter	
2 tab	2 tab	3 enter	
2 tab	2 tab	5 enter	
1 tab	3 tab	12 enter	
1 tab	3 tab	11 enter	
1 tab	3 tab	13 enter	
2 tab	3 tab	1 enter	
2 tab	3 tab	2 enter	
2 tab	3 tab	3 enter	

> The data may also be entered down one column at a time entering all the code numbers for gender with 1 being female and 2 male, then moving on to column two and entering all the code numbers for crime with 1 being assault, 2 being robbery, and 3 being crime and then moving on to column 3 and entering the numbers for the sentence administered.

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **General Linear Model** then
   b. Click on **Univariate**
2. Highlight the word **Sentence** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Dependent** Box
3. Highlight the word **Crime** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Fixed Factor(s)** Box.
4. Highlight the word **Gender** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Fixed Factor(s)** Box.
5. Click on **Options** Button
   a. Highlight the word **Crime** by clicking on it then
   b. Click on **Arrow >** to transfer this name to the **Display Means Box.**
   c. Highlight the word **Gender** by clicking on it then
   d. Click on **Arrow >** to transfer this name to the **Display Means Box**.
   e. Highlight the words **crime*gender** by clicking on it then
   f. Click on **Arrow >** to transfer this name combination to the **Display Means Box**.
6. Click on white square next to the words **descriptive statistics** to put a check mark in the box
7. Click **Continue**
8. Click **OK**
9. Your results will appear in a Window. Scroll up using the slide bar on the right to the top of the output. The results of this analysis are presented below.

Descriptive Statistics

Dependent Variable: SENTENCE

Crime Type	Juror Gender	Mean	Std. Deviation	N
Assault	Females	6.0000	2.00000	3
	Males	6.0000	2.00000	3
	Total	6.0000	1.78885	6
Robbery	Females	5.0000	2.00000	3
	Males	5.0000	2.00000	3
	Total	5.0000	1.78885	6
Rape	Females	12.0000	1.00000	3
	Males	2.0000	1.00000	3
	Total	7.0000	5.54977	6
Total	Females	7.6667	3.60555	9
	Males	4.3333	2.34521	9
	Total	6.0000	3.41278	18

Tests of Between-Subjects Effects

Dependent Variable: SENTENCE

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	162.000[a]	5	32.400	10.800	.000
Intercept	648.000	1	648.000	216.000	.000
CRIME	12.000	2	6.000	2.000	.178
GENDER	50.000	1	50.000	16.667	.002
CRIME * GENDER	100.000	2	50.000	16.667	.000
Error	36.000	12	3.000		
Total	846.000	18			
Corrected Total	198.000	17			

a. R Squared = .818 (Adjusted R Squared = .742)

1. Crime Type

Dependent Variable: SENTENCE

Crime Type	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Assault	6.000	.707	4.459	7.541
Robbery	5.000	.707	3.459	6.541
Rape	7.000	.707	5.459	8.541

2. Juror Gender

Dependent Variable: SENTENCE

Juror Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Females	7.667	.577	6.409	8.925
Males	4.333	.577	3.075	5.591

3. Crime Type * Juror Gender

Dependent Variable: SENTENCE

Crime Type	Juror Gender	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Assault	Females	6.000	1.000	3.821	8.179
	Males	6.000	1.000	3.821	8.179
Robbery	Females	5.000	1.000	2.821	7.179
	Males	5.000	1.000	2.821	7.179
Rape	Females	12.000	1.000	9.821	14.179
	Males	2.000	1.000	-.179	4.179

10. For the problem above the null and alternative hypotheses are spelled out below:

H_{null}: a) The means of the two gender conditions will be equal. (There will be no main effect for gender)

b) The means of the three crime conditions will be equal. (There will be no main effect for crime)

c) The pattern of females' responses to the three types of crimes will be identical to the pattern of males' responses to the three types of crimes. (There will be no interaction between gender of juror and type of crime.

H_{alt}: a) The means of the two gender conditions will not be equal.

b) The means of the three crime conditions will not be equal.

c) There will be an interaction between juror gender and type of crime such that the pattern of female's responses to the three types of crimes will not be identical to the pattern of males' responses to the three types of crimes.

11. **Interpretation and APA writing template for Results Above**

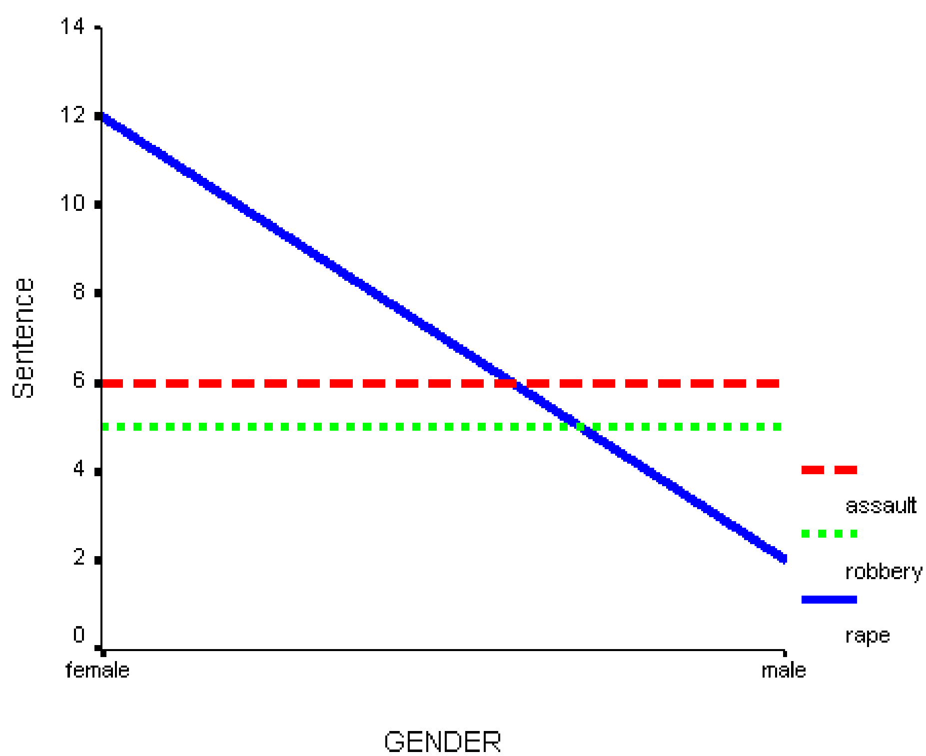
A 2 x 3 two way analysis of variance was conducted to determine whether juror gender and type of crime influenced how participant's sentenced the defendant. Results of that analysis indicated no main effect for type of crime, F (2,12) = 2.00, $p > .05$. The mean sentences for the crimes of assault, robbery, and rape were respectively M = 6.00, M = 5.00, and M = 7.00. Results did indicate a main effect for juror gender, F (1,12) = 16.667, $p < .05$, with females (M = 7.67) administering longer sentences than males (M = 4.33). The main effect for juror gender, however, gets qualified by a significant juror gender by type of crime interaction, F (2,12) = 16.667, $p < .05$. A post ANOVA Tukey test comparing the interaction means indicated female and male jurors responded in similar ways to the crimes of assault (M = 6.00 for both females and males) and robbery (M = 5.00 for both females and males). Female jurors, however, administered a significantly harsher sentence to the rapist (M = 12.00) than male jurors (M = 2.00), $p < .05$.

Graphics: Creating Line Graphs or Bar Charts

In the instructions that follow, the symbol > means to left click the word which follows the symbol. For example, > graph means to left click the word graph. To create a line graph for the results of the two way analysis of variance test use the following instructions.

Line Graph Instructions:

1. > Graph > Line > Summaries for Groups of Cases > **Multiple** > Define
2. Click dot for other summary function
3. Highlight sentence (dependent variable) and then click on right arrow to move to the white box labeled **variable**
4. Highlight crime (independent variable) and then click on right arrow and move to the white box called **define lines by**
5. Highlight gender (other independent variable) and then click on right arrow and move to the white box called **category axis**.
6. > ok Spss will create the figure
7. You can change the style of the various lines in the figure by clicking **format**, then click **line style** then select a line style and then click **apply**
8. To switch to a bar graph double click on the figure which will put you in **Chart Editor** mode. Then
9. **> Gallery > Bar > Clustered > Replace**



Repeated Measures Twoway Analysis of Variance

A researcher was interested in whether frequency of exposure to a picture of an ugly or attractive person would influence one's liking for the photograph. In order to find out the researcher, at the start of each class he taught, pinned a large photograph of an ugly and attractive person in front of the class. At the end of the class period the students in the class were asked to rate on a 7 point liking scale the extent to which they found the persons depicted in the photos to be likeable on a scale similar to the one below.

unlikeable -3 -2 -1 0 1 2 3 likeable

The psychologist posted the pictures at the start of each class period and had the students rate their liking for the two pictures at the end of the lst class, again after 5 classes and finally again after 10 classes. Thus **each** student gave **3 ratings** for **each** of the two photographs (after 1 exposure, 5 exposures and 10 exposures).

To summarize, the researcher manipulated two variables. They were type of photograph (ugly, attractive) and frequency of exposure (1 time, 5 times, and 10 times). **Each student** was in **all** conditions of the experiment so we have a two factor repeated measures ANOVA (2 x 3 to be exact). The researcher then recorded the liking scores that each student gave in the following table.

Column Independent Variable
Frequency of Exposure

Row Independent Variable	Student	**Column 1** (Day 1)	**Column 2** (Day 5)	**Column 3** (Day 10)
Attractive Photo **(Row 1)**	John	1	2	3
	Sue	2	1	3
	Sally	2	2	2
	Frank	1	1	3
Ugly Photo **(Row 2)**	John	-1	-2	-3
	Sue	0	0	-2
	Sally	-1	-1	-3
	Frank	-2	-1	-3

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.
   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **day1att**
6. Click on the white cell in **Row 1** under the word **Label** and type in **day1 attractive**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 2** under the word **Name** and type in the word **day5att**
8. Click on the white cell in **Row 2** under the word **Label** and type in **day5 attractive** (Doing this will provide you with a more expansive label in the results output).
9. Click on the white cell in **Row 3** under the word **Name** and type in the word **day10att**
10. Click on the white cell in **Row 3** under the word **Label** and type in **day10 attractive** (Doing this will provide you with a more expansive label in the results output).
11. Click on the white cell in **Row 4** under the word **Name** and type in the word **day1ugly**
12. Click on the white cell in **Row 4** under the word **Label** and type in **day1 ugly** (Doing this will provide you with a more expansive label in the results output).
13. Click on the white cell in **Row 5** under the word **Name** and type in the word **day5ugly**
14. Click on the white cell in **Row 5** under the word **Label** and type in **day5 ugly** (Doing this will provide you with a more expansive label in the results output).
15. Click on the white cell in **Row 6** under the word **Name** and type in the word **day10ugl** (notice the y in ugly is not typed because variable names are limited to 8 characters).
16. Click on the white cell in **Row 6** under the word **Label** and type in **day10 ugly** (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

17. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **day1att**, Column 2 named **day5att**, Column 3 named **day10att**, Column 4 named **day1ugly**, Column 5 named **day5ugly**, and Column 6 named **day10ugl**
18. Enter the **six** responses for each of the 4 participants (John through Frank). The six columns of numbers represent respectively participant responses for the conditions attractive day1; attractive day5; attractive day10; ugly day1; ugly day5; and ugly day10. Thus for John mouse to column 1 and enter:

1 tab 2 tab 3 tab -1 tab -2 tab -3 enter (Then mouse to row two column 1 to enter the data for Sue etc.)
2 tab 1 tab 3 tab 0 tab 0 tab -2 enter (These are Sue's responses)
2 tab 2 tab 2 tab -1 tab -1 tab -3 enter (These are Sally's responses)
1 tab 1 tab 3 tab -2 tab -1 tab -3 enter (These are Frank's responses)

Data Analysis

1. Click **Analyze** at top of screen then
   a. Click on **General Linear Model** then
   b. Click on **GLM-Repeated Measures** (When you do this a **Define Factor(s)** Box will appear)
2. In the within subject **Factor** name space, type in the word **appear** (for appearance) and then
   a. Click on the Number of **Levels** space and enter a **2** since there are two levels of appearance and then
   b. Click the **Add** button: appear(2) will now appear in the bottom white box
3. In the within subject **Factor** name space, type in the word **day** and then

a. Click on the Number of **Levels** space and enter a **3** since there are three levels of days and then

b. Click the **Add** button: day(3) will also appear in the bottom white box

4. Click on the **Define** button. A list of the 6 conditions of the experiment will appear on the left and a series of __?__[1,1] will appear on the right
5. Click on **day1att** to highlight it and then the right arrow to move it to the [1,**1**] slot
6. Click on **day5att** to highlight it and then the right arrow to move it to the [1,**2**] slot
7. Click on **day10att** to highlight it and then the right arrow to move it to the [1,**3**] slot
8. Click on **day1ugly** to highlight it and then the right arrow to move it to the [**2**,1] slot
9. Click on **day5ugly** to highlight it and then the right arrow to move it to the [**2**,2] slot
10. Click on **day10ugl** to highlight it and then the right arrow to move it to the [**2**,3] slot
11. Click on **OK**. Doing this will then result in the analysis being conducted. These results are below.
12. After the results of the analysis of variance appear, to get **descriptive** statistics like the **mean** and **standard deviations** for each group of the experiment
    a. Click on **Analyze** then
    b. Click on **Descriptives** and you will get a descriptives box. Make sure all treatment names are in the **variables** box.
    c. Click **options** and make sure mean and standard deviation are checked.
13. Click **Continue**
14. Click **OK.** Results of the analysis will then emerge in the results output at the tail end of the file.

Multivariate Tests[b]

Effect		Value	F	Hypothesis df	Error df	Sig.
APPEAR	Pillai's Trace	.980	147.000[a]	1.000	3.000	.001
	Wilks' Lambda	.020	147.000[a]	1.000	3.000	.001
	Hotelling's Trace	49.000	147.000[a]	1.000	3.000	.001
	Roy's Largest Root	49.000	147.000[a]	1.000	3.000	.001
DAY	Pillai's Trace	.250	.333[a]	2.000	2.000	.750
	Wilks' Lambda	.750	.333[a]	2.000	2.000	.750
	Hotelling's Trace	.333	.333[a]	2.000	2.000	.750
	Roy's Largest Root	.333	.333[a]	2.000	2.000	.750
APPEAR * DAY	Pillai's Trace	.964	27.000[a]	2.000	2.000	.036
	Wilks' Lambda	.036	27.000[a]	2.000	2.000	.036
	Hotelling's Trace	27.000	27.000[a]	2.000	2.000	.036
	Roy's Largest Root	27.000	27.000[a]	2.000	2.000	.036

a. Exact statistic

b.
Design: Intercept
Within Subjects Design: APPEAR+DAY+APPEAR*DAY

Mauchly's Test of Sphericity[b]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[a] Greenhouse-Geisser	Huynh-Feldt	Lower-bound
APPEAR	1.000	.000	0	.	1.000	1.000	1.000
DAY	.720	.657	2	.720	.781	1.000	.500
APPEAR * DAY	.667	.811	2	.666	.750	1.000	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

b.

Design: Intercept
Within Subjects Design: APPEAR+DAY+APPEAR*DAY

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
APPEAR	Sphericity Assumed	73.500	1	73.500	147.000	.001
	Greenhouse-Geisser	73.500	1.000	73.500	147.000	.001
	Huynh-Feldt	73.500	1.000	73.500	147.000	.001
	Lower-bound	73.500	1.000	73.500	147.000	.001
Error(APPEAR)	Sphericity Assumed	1.500	3	.500		
	Greenhouse-Geisser	1.500	3.000	.500		
	Huynh-Feldt	1.500	3.000	.500		
	Lower-bound	1.500	3.000	.500		
DAY	Sphericity Assumed	.333	2	.167	.600	.579
	Greenhouse-Geisser	.333	1.563	.213	.600	.548
	Huynh-Feldt	.333	2.000	.167	.600	.579
	Lower-bound	.333	1.000	.333	.600	.495
Error(DAY)	Sphericity Assumed	1.667	6	.278		
	Greenhouse-Geisser	1.667	4.688	.356		
	Huynh-Feldt	1.667	6.000	.278		
	Lower-bound	1.667	3.000	.556		
APPEAR * DAY	Sphericity Assumed	12.000	2	6.000	18.000	.003
	Greenhouse-Geisser	12.000	1.500	8.000	18.000	.008
	Huynh-Feldt	12.000	2.000	6.000	18.000	.003
	Lower-bound	12.000	1.000	12.000	18.000	.024
Error(APPEAR*DAY)	Sphericity Assumed	2.000	6	.333		
	Greenhouse-Geisser	2.000	4.500	.444		
	Huynh-Feldt	2.000	6.000	.333		
	Lower-bound	2.000	3.000	.667		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	APPEAR	DAY	Type III Sum of Squares	df	Mean Square	F	Sig.
APPEAR	Linear		73.500	1	73.500	147.000	.001
Error(APPEAR)	Linear		1.500	3	.500		
DAY		Linear	.250	1	.250	.600	.495
		Quadratic	8.333E-02	1	8.333E-02	.600	.495
Error(DAY)		Linear	1.250	3	.417		
		Quadratic	.417	3	.139		
APPEAR * DAY	Linear	Linear	9.000	1	9.000	54.000	.005
		Quadratic	3.000	1	3.000	6.000	.092
Error(APPEAR*DAY)	Linear	Linear	.500	3	.167		
		Quadratic	1.500	3	.500		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	.667	1	.667	.857	.423
Error	2.333	3	.778		

Descriptive Statistics

	N	Mean	Std. Deviation
day1 attractive	4	1.5000	.57735
day5 attractive	4	1.5000	.57735
day10 attractive	4	2.7500	.50000
day1 ugly	4	-1.0000	.81650
day5 ugly	4	-1.0000	.81650
day10 ugly	4	-2.7500	.50000
Valid N (listwise)	4		

15. For the problem above the null and alternative hypotheses are spelled out below:

Hnull:
a) The mean liking responses for all appearance conditions will be equal (there will be no main effect for appearance).
b) The mean liking responses for all day conditions will be equal (there will be no main effect for point in time when the liking evaluations are given).
c) There will be no interaction between appearance and day of evaluation (the pattern of responses for the attractive photo across days will be no different than the pattern of responses for the ugly photo across days).

Halt:
a) The mean liking responses for the attractive photo will not equal the mean liking responses for the ugly photo (there will be a main effect for appearance).
b) The mean liking responses for all day conditions will not be equal.
c) The pattern of responses for the attractive photo across days will be different than the pattern of responses for the ugly photo across days.

16. **Interpretation and APA writing template for Results Above**

A 2 x 3 repeated measures two way analysis of variance was conducted to determine whether attractiveness of photo and frequency of exposure to that photo influenced how much participants liked that photo. Results of the analysis indicated a main effect for photo attractiveness, $F\,(1,3) = 147.00$, $p < .05$, with the attractive photo ($M = 1.916$) liked more than the ugly photo ($M = -1.583$). There was no main effect for frequency of exposure to the photo, $F\,(2,6) = .60$, $p > .05$. The mean liking evaluations on day 1, after 5 days of exposure, and after 10 days of exposure were respectively 0.25, 0.25, and 0.00. There was, however, a significant attractiveness of photo by frequency of exposure interaction, $F\,(2,6) = 18.00$, $p < .05$. A Tukey test indicated that within the attractive condition, frequency of exposure did not significantly influence liking for the photograph. A comparison of the liking evaluations on day 1 ($M = 1.50$, $SD = .577$), day 5 ($M = 1.50$, $SD = .577$) and day 10 ($M = 2.75$, $SD = .50$) indicated that none of the differences between conditions were significant, $p > .05$. In contrast the Tukey test indicated that on day 10 participants had a significantly *less* favorable liking evaluation for the ugly photo ($M = -2.75$, $SD = .50$) than they did on either day 1 ($M = -1.00$, $SD = .816$), or day 5 ($M = -1.00$, $SD = .816$), $p < .05$.

Two Way Analysis of Variance - Two Factor Mixed Design

(2 Independent Variables with repeated measure on One Factor)

For this problem, a researcher was interested in finding out if group discussion would influence a participant's willingness to engage in greater risk taking. The researcher felt that people would be more likely to make a risky decision after discussion than prior to discussion. The researcher was also interested in whether the discussion process would influence the decisions of men differently than the decisions of women. What the researcher did was to take a group of male and female participants and had them read a story that involved their being put in the position of an advisor to a businessman who was considering a job change to a newly forming company. The participant was to read the story and decide what the new company's minimal odds of success would have to be before recommending the businessman make a job change to that company. Notice that the lower the minimal odds of success before recommending the change, the greater risk the participant is taking. The participant circled one of the numbers from a scale like that below:

The minimal odds of success of the new company would have to be:

chances out of 10: 1 2 3 4 5 6 7 8 9 10: chances out of 10

before I recommended a job change for the businessman.

After giving their individual recommendations, each participant discussed their opinion about the story with a group of other people. Then after the discussion process, they were again asked a second time to complete the risk scale above. The purpose of this was to determine whether the discussion process facilitated the participant recommending a more conservative or more risky decision. The responses for the male and female participants, both prior to and after discussion are listed below.

		(Column 1) Prior to Discussion	(Column 2) After Discussion
	S1	7	5
	S2	8	6
Males	S3	7	6
(Row 1)	S4	6	4
	S5	5	3
	S6	5	3
	S7	6	4
Females	S8	7	6
(Row 2)	S9	9	7
	S10	7	5

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.
   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Gender**
6. Click on the white cell in **Row 1** under the word **Label** and type in **Subject Gender**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 1** under the word **Values**. The word none will appear along with a small grey box to the right.
   a. Click on the small grey box and a Value Labels window will appear
   b. In the white box next to the word **Value**, type in the number **1**
   c. Click on the white box next to the word **Value Label** and type in **Males** then
   d. Click on **Add** button: 1 = "Males" will appear in bottom white box
   e. Click on the white box next to the word **Value** and type in the number **2** then
   f. Click on the white box next to the word **Value Label** and type in **Females** then
   g. Click on **Add** button: 2 = "Females" will appear in bottom white box also
   h. Click **OK**
8. Click on the white cell in **Row 2** under the word **Name** and type in the word **Prior** then
9. Click on the white cell in **Row 2** under the word **Label** and type in **Pre Discussion** (Doing this will provide you with a more expansive label in the results output).
10. Click on the white cell in **Row 3** under the word **Name** and type in the word **Post** then
11. Click on the white cell in **Row 3** under the word **Label** and type in the **Post Discussion** (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

12. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Gender** (for subject gender), Column 2 named **Prior** (for the pre-discussion responses), and Column 3 named **Post** (for the Post-discussion responses).
13. Enter the data for each of the 10 participants as follows. Click on the top left cell under the first column **Gender** and enter:

   1 tab 7 tab 5
   1 tab 8 tab 6
   1 tab 7 tab 6
   1 tab 6 tab 4
   1 tab 5 tab 3
   2 tab 5 tab 3
   2 tab 6 tab 4
   2 tab 7 tab 6

> The numbers on each line (e.g. 1, 7, 5) represent in order the code for gender where a 1 = males and a 2 = females, the pre-discussion response and the post-discussion response.

2 tab 9 tab 7
2 tab 7 tab 5

Data Analysis

1. Click **Analyze** at top of screen then
   i. Click on **General Linear Model** then
   j. Click on **GLM-Repeated Measures** (When you do this a Define Factor(s) box will appear)
2. In the **within subject factor** name space, double click on **Factor 1** and type in **Discuss** then
   a. Click on the Number of **Levels** space and enter a **2** (since there are two levels of discussion - pre & post discussion.
   b. Click on the **Add** button
3. Click on **Define** button
4. Highlight the word **Pre-Discussion [prior]** by clicking on it, then
   a. Click on **arrow >** to transfer this name to the **within** subjects variable Box at __?__[1]
5. Highlight the word **Post Discussion [post]** by clicking on it, then
   a. Click on **arrow >** to transfer this name to the **within** subjects variable Box at __?__[2]
6. Highlight the word **Subject Gender [gender]** by clicking on it, then
   a. Click on **arrow >** to transfer this name to the **Between** subjects **Factor** Box
7. Click on **Options** button
8. Highlight (**Overall**) by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Display Means** for Box
9. Highlight **Gender** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Display Means** for Box
10. Highlight **Discuss** by clicking on it then
    a. Click on **arrow >** to transfer this name to the **Display Means** for Box
11. Highlight **Gender*Discuss** by clicking on it then
    a. Click on **arrow >** to transfer this name to the **Display Means** for Box
12. Click on white square in front of **descriptives statistics** box to place a check mark in it (appears under the heading "display"
13. Click on **Continue** button
14. Click **OK** Doing this will result in the analysis being conducted. These results are below.

Descriptive Statistics

	Subject Gender	Mean	Std. Deviation	N
Pre Discussion	Males	6.6000	1.14018	5
	females	6.8000	1.48324	5
	Total	6.7000	1.25167	10
Post Discussion	Males	4.8000	1.30384	5
	females	5.0000	1.58114	5
	Total	4.9000	1.37032	10

Multivariate Tests[b]

Effect		Value	F	Hypothesis df	Error df	Sig.
DISCUSS	Pillai's Trace	.953	162.000[a]	1.000	8.000	.000
	Wilks' Lambda	.047	162.000[a]	1.000	8.000	.000
	Hotelling's Trace	20.250	162.000[a]	1.000	8.000	.000
	Roy's Largest Root	20.250	162.000[a]	1.000	8.000	.000
DISCUSS * GENDER	Pillai's Trace	.000	.000[a]	1.000	8.000	1.000
	Wilks' Lambda	1.000	.000[a]	1.000	8.000	1.000
	Hotelling's Trace	.000	.000[a]	1.000	8.000	1.000
	Roy's Largest Root	.000	.000[a]	1.000	8.000	1.000

a. Exact statistic

b.

Design: Intercept+GENDER
Within Subjects Design: DISCUSS

Mauchly's Test of Sphericity[b]

Measure: MEASURE_1

					Epsilon[a]		
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Greenhouse-Geisser	Huynh-Feldt	Lower-bound
DISCUSS	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in t Tests of Within-Subjects Effects table.

b.

Design: Intercept+GENDER
Within Subjects Design: DISCUSS

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
DISCUSS	Sphericity Assumed	16.200	1	16.200	162.000	.000
	Greenhouse-Geisser	16.200	1.000	16.200	162.000	.000
	Huynh-Feldt	16.200	1.000	16.200	162.000	.000
	Lower-bound	16.200	1.000	16.200	162.000	.000
DISCUSS * GENDER	Sphericity Assumed	.000	1	.000	.000	1.000
	Greenhouse-Geisser	.000	1.000	.000	.000	1.000
	Huynh-Feldt	.000	1.000	.000	.000	1.000
	Lower-bound	.000	1.000	.000	.000	1.000
Error(DISCUSS)	Sphericity Assumed	.800	8	.100		
	Greenhouse-Geisser	.800	8.000	.100		
	Huynh-Feldt	.800	8.000	.100		
	Lower-bound	.800	8.000	.100		

4. Subject Gender * DISCUSS

Measure: MEASURE_1

Subject Gender	DISCUSS	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Males	1	6.600	.592	5.236	7.964
	2	4.800	.648	3.306	6.294
females	1	6.800	.592	5.436	8.164
	2	5.000	.648	3.506	6.494

Mea

Sour	g.
DISC	.000
DISC	.000
Erroı	

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	672.800	1	672.800	179.413	.000
GENDER	.200	1	.200	.053	.823
Error	30.000	8	3.750		

1. Grand Mean

Measure: MEASURE_1

Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
5.800	.433	4.801	6.799

2. Subject Gender

Measure: MEASURE_1

Subject Gender	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Males	5.700	.612	4.288	7.112
females	5.900	.612	4.488	7.312

3. DISCUSS

Measure: MEASURE_1

DISCUSS	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1	6.700	.418	5.735	7.665
2	4.900	.458	3.843	5.957

15. For the problem above the null and alternative hypotheses are spelled out below:

H_{null}:
a) The means of the two gender conditions will be equal. (There will be no main effect for gender).
b) The means of the pre and post group discussion responses will be equal. (There will be no main effect for discussion).
c) The pattern of the pre to post discussion responses for females will be identical to the pattern of pre to post discussion responses for males.

H_{alt}:
a) The means of the two gender conditions will not be equal. (There will be a main effect for gender).
b) There will be a main effect for discussion with the post discussion responses reflecting a greater amount of risk taking than the pre discussion responses.
c) The pattern of the pre to post discussion responses for females will not be identical to the pattern of pre- to post discussion responses for males.

16. **Interpretation and APA writing template for Results Above**

A 2 x 2 two way mixed analysis of variance was conducted to determine whether discussion and participant gender influenced the level of risk a participant was willing to take. Results of that analysis indicated no main effect for participant gender, F (1, 8) = .05, p > .05. The mean levels of risk taking for males and females were, respectively, 5.7, and 5.9. Results did indicate a main effect for discussion, F (1, 8) = 162.00, p < .05 with the post discussion responses reflecting significantly greater risk taking (M = 4.9) than the pre discussion responses (M = 6.7). The interaction between participant gender and discussion was not significant, F (1,8) = 0.00, p > .05.

Graphics: Creating Line Graphs or Bar Charts
ANOVA - Two Factor Mixed Designs

In the instructions that follow, the symbol > means to left click the word which follows the symbol. For example, > graph means to left click the word graph. To create a line graph for the results of the Mixed two way analysis of variance test use the following instructions.

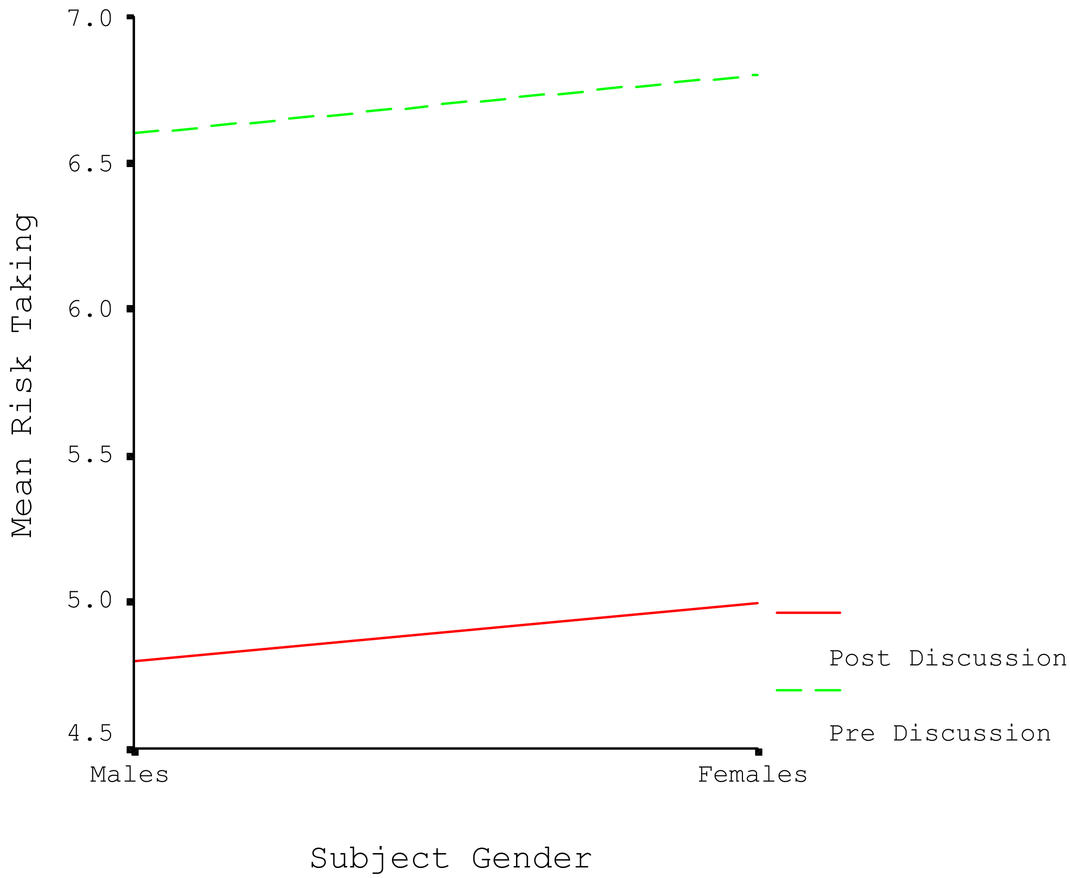
Line Graph Instructions:

1. > Graph > Line > summaries of **separate** variables > **Muliple** > Define
2. Highlight Gender (the between subjects independent variable) and then click on the right arrow to move gender to white box labeled **Category Axis**.
3. Highlight **Prior** and then click on right arrow to move to the white box labeled **Lines Represent**
4. Highlight **Post** and then click on right arrow to move to the white box labeled **Lines Represent**
5. > Ok At this point Spss will create line graph

Moving Axis Labels to Center of Axis and Creating "Broken Lines" to Distinguish Lines

1. Double click on figure to bring up **Chart Editor**
2. > Chart > inner frame. This will remove the frame surrounding the figure
3. > Chart > axis > scale > ok. This will bring up a **scale axis** menu with the word **mean** (representing the dependent variable in the axis title box). Highlight the word mean and replace it with the words **Mean Risk Taking**. Immediately below is the title justification box with left/ bottom showing.
4. Click the down arrow next to left/bottom and highlight the word **center**.
5. > ok. Doing this will center the label Mean Risk Taking on the vertical axis.
6. > Chart > Axis > blank dot next to the word category > Ok. This will bring up the **category axis** menu with the independent variable (subject gender) in the axis title box. Immediately below is the title justification box with left/bottom showing.
7. Click the down arrow next to left/bottom and highlight the word center
8. > ok. Doing this will center the subject gender label on the horizontal axis.
9. Click on the pre discussion line
10. > format > line style. Select a broken dotted line and also a heavier weight line.
11. > apply

The figure depicting the results of the above is on the next page.



Note that in this problem, **lower** numbers on the dependent variable (vertical axis) represent **greater** levels of risk taking.

Chi-Square

The present research problem is **conceptually** similar to the independent groups t test problem described on page 4, however, the present researcher differs by measuring the participant's responses on a dependent variable measured by a nominal scale. In the present problem the researcher was interested in finding out if participants would be more likely to agree to a message if it was presented to them by a **high** credible source than if it was presented to them by a **low** credible source. The researcher felt that people would be more likely to agree to a message if it was delivered to them by a high credible speaker. Participants were randomly assigned to one of two conditions. All participants in the experiment read the exact same message. However for 30 of the participants the message was purported to have been written by a noble prize winning doctor of medicine. For the other 50 of the participants the message was purported to have been written by a man doing time for medical quackery. The message stressed the importance of exercise for lowering blood pressure. After reading the message, the participants were then simply asked to check a box indicating whether they agreed with the speaker or disagreed with the speaker. (This is **un**like the problem on page 1 where the participants indicated the **degree** to which they agreed with the speaker). In the present study, the participants are giving a categorical response (nominal scale).

The researcher then recorded the number (frequency count) of participants who agreed or alternatively disagreed with the high credible speaker. The researcher also recorded the number (frequency count) of participants who agreed or alternatively disagreed with the low credible speaker. The results of this tabulation are in the table below where the numbers in the cells are frequency counts

	Speaker Credibility	
	High Column 1	**Low** Column 2
Agreed (Row 1)	25	10
Disagreed (Row 2)	5	40

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.
   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Freq** (for frequency)

6. Click on the white cell in **Row 1** under the word **Label** and type in **Frequency**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 2** under the word **Name** and type in the word **Decision**
8. Click on the white cell in **Row 2** under the word **Label** and type in **Decision**. (Doing this will provide you with a more expansive label in the results output).
9. Click on the white cell in **Row 2** under the word **Values**. The word none will appear along with a small grey box to the right.
   a. Click on the small grey box and a Value Labels window will appear
   b. Click on the white box next to the word **Value**, type in the number **1**
   c. Click on the white box next to the word **Value Label** and type in **Agreed**
   d. Click on **Add** button: 1 = "Agreed" will appear in bottom white box
   e. Click on the white box next to the word **Value**, type in the number **2**
   f. Click on the white box next to the word **Value Label** and type in **Disagreed**
   g. Click on **Add** button: 2 = "Disagreed" will appear in bottom white box
   h. Click **OK**
10. Click on the white cell in **Row 3** under the word Name and type in the word **Source**
11. Click on the white cell in **Row 3** under the word **Label** and type in the words **Source Credibility**. (Doing this will provide you with a more expansive label in the results output).
12. Click on the white cell in **Row 3** under the word **Value**. The word none will appear along with a small grey box to the right.
   a. Click on the small grey box and a Value Labels window will appear
   b. Click on the white box next to the word **Value**, type in the number **1**
   c. Click on the white box next to the word **Value Label** and type in **High**
   d. Click on **Add** button: 1 = "**High**" will appear in bottom white box
   e. Click on the white box next to the word **Value**, type in the number **2**
   f. Click on the white box next to the word **Value Label** and type in **Low**
   g. Click on **Add** button: 2 = "**Low**" will appear in bottom white box
   h. Click on **Ok**

DATA ENTRY PHASE

13. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **freq** (for frequency), Column 2 named **Decision**, and Column 3 named **Source**
14. Enter the data for each of the four cells as follows. Mouse to the top cell under the first column which is **freq** and type

25 tab 1 tab 1 Then mouse to the second row and enter
5 tab 2 tab 1 Then mouse to the third row and enter
10 tab 1 tab 2 Then mouse to the fourth row and enter
40 tab 2 tab 2

> The three number in each row represent respectively the frequency, the row cell of the table where a 1 means agreed and a 2 means disagreed, and the column of the table where a 1 means high credibility and a 2 means low credibility.

1. Click on **Data** at top of screen then
   a Click on **Weight Cases** then
   b. Click on **circle** by **Weight Cases by** (a dot will appear) then
   c. Highlight **Freq** by clicking on it then
   d. Click on **arrow >** to transfer this name (freq) to the **Frequency Variable** Box then
   e. Click on **OK**
2. Click **Analyze** at top of screen then
   a. Click on **Descriptive Statistics** then
   b. Click on **Crosstabs**
3. Highlight **decision** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Row(s)** box
4. Highlight **Source** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Column(s)** box
5. Click on **Statistics** button then
   a. Click on white square next to **Chi-square**. This will put a check in the box.
6. Click **Continue** button
7. Click **Cells** button then
   a. Click on white squares next to **Observed** and **Expected** to put a check mark in the box if one is not already there then
8. Click **Continue** button
9. Click **OK.** Doing this will result in analysis being conducted. These results are below.

decision * Source Credibility Crosstabulation

			Source Credibility		
			High Credibility	Low Credibility	Total
decision	agreed	Count	25	10	35
		Expected Count	13.1	21.9	35.0
	disagreed	Count	5	40	45
		Expected Count	16.9	28.1	45.0
Total		Count	30	50	80
		Expected Count	30.0	50.0	80.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	30.561[b]	1	.000		
Continuity Correction[a]	28.041	1	.000		
Likelihood Ratio	32.576	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	30.179	1	.000		
N of Valid Cases	80				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.13.

10. For the problem above the null and alternative hypothesis are spelled out below:

H_{null}: There will be no relationship between source credibility and whether the participant decides to agree or disagree with the speaker. In other words, the proportion of participants agreeing to the high credible source will be no different than the proportion of participants agreeing to the low credible source.

H_{alt}: There will be a relationship between source credibility and whether the participant decides to agree or disagree with the speaker. In other words, the proportion of participants who agree with the high credible speaker will be greater than the proportion of participants who agree with the low credible speaker.

11. **Interpretation and APA writing template for Results Above**:

A chi square analysis was conducted to determine whether source credibility was related to a participant's decision to agree or disagree with a speaker. Results of that analysis indicated that participants were significantly more likely to agree with a message when it was presented by a high credible speaker than when it was presented by a low credible speaker, $\_^2 (1) = 30.56$, $p < .05$.

Alternative Procedure for Chi-Square Data Entry

The following is an alternative way to enter data in a data file and set up control language for a chi-square analysis. This is the standard procedure used if a researcher does **not** want to count up by hand the frequency of participants who responded in a particular categorical way. The following example is based upon a very small number of subjects. With a large sample of subjects this procedure would be more efficient.

Suppose a researcher was interested in finding out if male and female jurors differed from one another in the extent to which they were conviction (guilt) prone when deciding the guilt or innocence of a defendant. To find out if the two sexes differed from one another on conviction proneness, the researcher took a random sample of 10 male jurors and 10 female jurors and had them read an abstract of a legal case and then based upon the evidence presented, judged the defendant as either guilty or not guilty. In a data file the researcher recorded a 1 if the juror found the defendant not guilty and a 2 if guilty. The researcher also recorded whether the juror was a male (scored as a 1) or a female (scored as a 2). The researcher recorded each response in a table which looked liked that below:

Verdict	Juror Sex
2	1
1	1
1	2
1	2
2	1
2	2
2	1
1	1
1	1
2	2
2	1
2	2
1	1
1	1
1	1
1	2
2	2
2	2
2	2
1	2

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.

Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Verdict**
6. Click on the white cell in **Row 1** under the word **Label** and type in **Verdict**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 1** under the word **Value**. The word none will appear along with a small grey box to the right.
   a. Click on the small grey box and a Value Labels window will appear.
   b. Click on the white box next to the word **Value**, type in the number **1**
   c. Click on the white box next to the word **Value Label** and type in **not guilty**
   d. Click on **Add** button: 1 = "not guilty" will appear in bottom white box
   e. Click on the white box next to the word **Value**, type in the number **2**
   f. Click on the white box next to the word **Value Label** and type in **guilty**
   g. Click on **Add** button: 2 = "guilty" will appear in bottom white box also
   h. Click **Ok**
8. Click on the white cell in **Row 2** under the word **Name** and type in the word **Gender**
9. Click on the white cell in **Row 2** under the word **Label** and type in the words **Juror Sex**. (Doing this will provide you with a more expansive label in the results output).
10. Click on the white cell in **Row 2** under the word **Value**. The word none will appear along with a small grey box to the right.
   a. Click on the small grey box and a Value Labels window will appear.
   b. Click on the white box next to the word **Value**, type in the number **1**
   c. Click on the white box next to the word **Value Label** and type in **Male**
   d. Click on **Add** button: 1 = "male" will appear in bottom white box
   e. Click on the white box next to the word **Value**, type in the number **2**
   f. Click on the white box next to the word **Value Label** and type in **Female**
   g. Click on **Add** button: 2 = "Female" will appear in bottom white box also
   h. Click **Ok**

DATA ENTRY PHASE

11. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Verdict**, and Column 2 named **Gender**
12. Enter the data for each of the twenty participants as follows. Mouse to the top cell under the first column which is Verdict and type

2 tab 1 Then mouse to the second row and enter
1 tab 1 Then mouse to the third row and enter
1 tab 2 etc.
1 tab 2
2 tab 1
2 tab 2
2 tab 1
1 tab 1
1 tab 1
2 tab 2
2 tab 1
2 tab 2
1 tab 1
1 tab 1
1 tab 1
1 tab 2

The ones and twos in the first column are the codes for the juror's verdict where a 1 = not guilty and a 2 guilty. The ones and twos in the second column are the codes for the juror's gender where a 1 = male and a 2 = female.

The numbers continue on the next page. The numbers may be entered one column at a time entering all the codes for the verdicts first in column 1 and then moving to column 2 and entering all the codes for gender.

2 tab 2
2 tab 2
2 tab 2
1 tab 2

Data Analysis

1. Click on **Data** at top of screen then
   a. Click on **Weight Cases** then
   b. Click on **Circle** by Do **NOT** Weight Cases (a dot will appear) then
   c. Click **OK**
2. Click **Analyze** at top of screen then
   a. Click on **Descriptive Statistics** then
   b. Click on **Crosstabs**
3. Highlight **Verdict** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Row(s)** box
4. Highlight **Gender** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Column(s)** box
5. Click on **Statistics** button at bottom of screen, then
   a. Click on white square next to **Chi-square**. This will put a check in the box.
6. Click **Continue** button
7. Click **Cells** button at bottom of screen, then
   a. Click on white squares next to **Observed** and **Expected** to put a check mark in the box if one is not already there then
8. Click **Continue** button
9. Click **OK.** Doing this will result in analysis being conducted. These results are below.

Verdict * Juror Sex Crosstabulation

			Juror Sex		
			male	female	Total
Verdict	not guilty	Count	6	4	10
		Expected Count	5.0	5.0	10.0
	guilty	Count	4	6	10
		Expected Count	5.0	5.0	10.0
Total		Count	10	10	20
		Expected Count	10.0	10.0	20.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.800[b]	1	.371		
Continuity Correction [a]	.200	1	.655		
Likelihood Ratio	.805	1	.369		
Fisher's Exact Test				.418	.328
Linear-by-Linear Association	.760	1	.383		
N of Valid Cases	20				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.00.

10. For the problem above the null and alternative hypothesis are spelled out below:

H_{null}: There will be no relationship between juror gender and whether the juror decides to find the defendant guilty or not guilty. In other words, the proportion of male jurors finding the defendant guilty will be no different than the proportion of female jurors finding the defendant guilty.

H_{alt}: There will be a relationship between juror gender and juror verdict. In other words, the proportion of male jurors who find the defendant guilty will be different than the proportion of female jurors finding the defendant guilty.

11. **Interpretation and APA writing template for Results Above:**

A chi square analysis was conducted to determine whether juror gender was related to juror verdict decision. Results of that analysis indicated that there was no relationship between juror gender and juror verdict, $\_^2$ (1) = .8000, p > .05.

Chi-square for Goodness of Fit

Suppose it is known that in a particular community the residents in the past have typically voted 2/3rds (i.e. .67) for the Republican Party Candidate and only 1/3rd (i.e. .33) for the Democratic Party Candidate. Suppose that due to a set of political circumstances you believe that the voting preferences in that community are going to be altered and will no longer be 2/3rds Republican. To find out you take a survey of a random sample of 18 people from the community and ask them how they intend to vote. You ask them to check whether they intend to vote Republican in the upcoming election (scored as a 1) or whether they intend to vote Democratic (scored as a 2). You record your data and obtained the following results.
(1,2,2,2,1,2,2,1,1,2,2,2,1,1,2,2,2,2).

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.
   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Party**
6. Click on the white cell in **Row 1** under the word **Label** and type in **Political Party**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 1** under the word **Value**. The word none will appear along with a small grey box to the right.
   a. Click on the small grey box and a Value Labels window will appear
   b. Click on the white box next to the word **Value**, type in the number **1**
   c. Click on the white box next to the word **Value Label** and type in **Republican**
   d. Click on **Add** button: 1 = "Republican" will appear in bottom white box
   e. Click on the white box next to the word **Value**, type in the number **2**
   f. Click on the white box next to the word **Value Label** and type in **Democrat**
   g. Click on **Add** button: 2 = "Democrat" will appear in bottom white box also
   h. Click on **Ok**

DATA ENTRY PHASE

8. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Party** (for Political Party).
9. Enter the data for each of the 18 participants as follows. Mouse to the top cell under the first column which is party and enter the numbers straight on down the column.

   1
   2

2
2
1
2
2
1
1
2
2
2
1
1
2
2
2
2

Data Analysis

1. Click **Analyze** at top of screen then
   a. Click on **Non-Parametric** Tests then
   b. Click on **Chi-Square**
2. Highlight **Party** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Test Variable List** box
3. Click **Circle** adjacent to **Values** in the Expected Values box. A dot will appear in circle
4. Click white square next to **Value** then
   a. Type in **.67** then
   b. Click **add** button then
   c. Type in **.33** then
   d. Click **add** button
5. Click **Options** button then
   a. Click white square next to **descriptives**
   b. Click **continue** button
6. Click **Ok.** The analysis will be conducted with the results below.

> The .67 and the .33 are expected values if the null hypothesis is true. These value will change depending on the specific null hypothesis of the problem.

political party

	Observed N	Expected N	Residual
Republican	6	12.1	-6.1
Democrat	12	5.9	6.1
Total	18		

Test Statistics

	Political Party
Chi-Square [a]	9.227
df	1
Asymp. Sig.	.002

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 5.9.

7. For the problem above the null and alternative hypothesis are spelled out below:

H_{null}: There will be no change in the proportion of people voting Republican and Democrat. In other words, the proportion of people voting Republican and Democrat will respectively be .67 and .33.

H_{alt}: There will be a change in the proportion of people voting Republican and Democrat. The proportion of people voting Republican and Democrat will no longer be .67 and .33 respectively.

8. **Interpretation and APA writing template for Results Above:**

A Chi-square goodness of fit test was conducted to determine whether the political party voting preferences of people in the community had changed. Results of the analysis indicated that a shift in voting preference had occurred with a larger proportion of people now voting for the Democratic party candidate, _^{2} (1) = 9.22, $\underline{p} < .05$.

Mann-Whitney U Test for Independent Samples

This test is similar to an independent groups t-test, however, the dependent variable is measured on an ordinal scale (ranked data). This test is used to test for significant differences between two conditions of an independent variable in an experiment where the dependent variable involves ranked data.

Suppose for example a sports psychologist (also interested in gerontology) wanted to find out if there was a difference in the finishing position between a group of professional golfers who qualified for the senior pro tour (age 50 and above) and a group of professional golfers who were on the regular pro tour (age 49 and below) in a golf tournament that contained both young and older professional golfers. The researcher recorded the finishing positions (rank order) of a number of golfers who played in the tournament and obtained the following results for their finishing positions in the tournament.

Finishing Positions of Players

On Regular Tour (age 49 & below)	Finished	On Senior Tour (age 50 & above)	Finished
Tiger Woods	2	Arnold Palmer	10
Tom Lehman	5	Jack Nicholas	4
Payne Stewart	1	Hale Irwin	8
John Daly	6	Ray Floyd	7
Ernie Els	3	Gary Player	9

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.
   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure
5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Tour**
6. Click on the white cell in **Row 1** under the word **Label** and type in **Tour**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 1** under the word **Value**. The word none will appear along with a small grey box to the right.
   a. Click on the small grey box and a Value Labels window will appear
   b. Click on the white box next to the word **Value**, type in the number **1**
   c. Click on the white box next to the word **Value Label** and type in **Regular Tour**
   d. Click on **Add** button: 1 = "Regular Tour" will appear in bottom white box
   e. Click on the white box next to the word **Value**, type in the number **2**
   f. Click on the white box next to the word **Value Label** and type in **Senior Tour**
   g. Click on **Add** button: 2 = "Senior Tour" will appear in bottom white box also
   h. Click **OK**

8. Click on the white cell in **Row 2** under the word **Name** and type in the word **Finish**
9. Click on the white cell in **Row 2** under the word **Label** and type in **Finishing Position**. (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

10. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Tour** and Column 2 named **Finish**.
11. Enter the data for each of the 5 players on the two tours as follows. Mouse to the top cell under the first column which is Tour and enter the following:

1 tab 2
1 tab 5
1 tab 1
1 tab 6
1 tab 3
2 tab 10
2 tab 4
2 tab 8
2 tab 7
2 tab 9

> The ones and twos in the first column are the codes for which tour the golfer is on where 1 = Regular Tour and 2 = Senior tour. The numbers in the second column represent the golfer's finishing position in the golf tournament.

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **Non-Parametric** Tests then
   b. Click on **2 Independent Samples**
2. Highlight the dependent variable which is **finish** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Test Variable List** box
3. Highlight the independent variable which is **Tour** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Group Variable** Box. The following should then appear **Tour [? ?]**
4. Click on **Define** Groups button
   a. Type in a **1** in the **Group 1** box
   b. Click on **Group 2** box and enter a **2**
   c. Click **Continue** button
5. Click on White square next to Mann-Whitney U to place a check mark in the box if one is not already there.
6. Click on the **options** button
7. Click on white square next to **Descriptives** to place a check mark in the box
   a. Click **continue** button
8. Click **OK**. Doing this will result in analysis being conducted. These results are below.

Ranks

	Tour	N	Mean Rank	Sum of Ranks
Finishing Position	Regular	5	3.40	17.00
	Senior	5	7.60	38.00
	Total	10		

Test Statistics [b]

	Finishing Position
Mann-Whitney U	2.000
Wilcoxon W	17.000
Z	-2.193
Asymp. Sig. (2-tailed)	.028
Exact Sig. [2*(1-tailed Sig.)]	.032[a]

a. Not corrected for ties.

b. Grouping Variable: Tour

9. For the problem above the null and alternative hypothesis are spelled out below:

H_{null}: There will be no difference in the finishing rank positions of professional golfers on the senior tour and professional golfers on the regular tour when playing in a common tournament.

H_{alt}: There will be a difference in the finishing rank positions of professional golfers on the senior tour and professional golfers on the regular tour when playing in a common tournament.

10. **Interpretation and APA writing template for Results Above:**

A Mann-Whitney U test was conducted to determine whether there was a difference in the finishing positions of senior and regular tour golfers who played in a common golf tournament. Results of that analysis indicated that there was a difference, $\underline{z} = -2.1934$, $\underline{p} < .05$ with golfers on regular tour finishing higher in the tournament than golfers on the senior tour.

Wilcoxon Matched Pairs Signed Rank Test

This test is similar to a matched (repeated measures) t-test. However, the dependent variable is measured on an **ordinal scale (ranked data).** This test is used to test for significant differences between **two** conditions of an independent variable in an experiment where the same (or matched) participants are responding in **both** conditions of the study. The dependent variable involves ranked (ordinal) data.

Suppose for example, a department chair wanted to find out whether their department faculty members had a significant preference for one job candidate over another. Each of two job candidates (Dr. Smith and Dr. Jones) came to the department for a job interview. After each candidate gave a one hour guest lecture to the members of the department, and after they were interviewed by the members of the department, the faculty in the department were asked to rank order their preferences for the candidates. The first choice of each department member was given a rank of 1 and their second choice a rank of 2. The department chair then recorded the rankings of each candidate by each department member in the table below:

Rank Order of Candidates by Faculty

Faculty Member	Dr. Smith	Dr. Jones
A	1	2
B	1	2
C	1	2
D	1	2
E	2	1
F	1	2
G	1.5	1.5
H	1	2
I	1	2
J	1	2

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2^{nd} option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.
   Name Type Width Decimals **Label Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Smith**
6. Click on the white cell in **Row 1** under the word **Label** and type in **Smith Rank**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 2** under the word **Name** and type in the word **Jones**
8. Click on the white cell in **Row 2** under the word **Label** and type in **Jones Rank**. (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

9. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Smith** and Column 2 named **Jones**.
10. Enter the data for each of the two candidates as follows. Mouse to the top cell under the first column which is Smith and enter the following:

1 tab 2
1 tab 2
1 tab 2
1 tab 2
2 tab 1
1 tab 2
1.5 tab 1.5
1 tab 2
1 tab 2
1 tab 2

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **Non-Parametric** Tests then
   b. Click on **2 Related Samples**
2 Highlight both **Smith and Jones** by clicking on them then
   a. Click on **arrow >** to transfer both name to the **Test Pair(s)** List box
3. Click on White square next to **Wilcoxon** to place a check mark in the box if one is not already there
4. Click on **Options** button
5. Click on white square next to **Descriptives** to place a check mark in the box
   a. Click **continue** button
6. Click **OK.** Doing this will result in analysis being conducted. These results are below.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Smith Rank	10	1.1500	.33747	1.00	2.00
Jones Rank	10	1.8500	.33747	1.00	2.00

Ranks

		N	Mean Rank	Sum of Ranks
Jones Rank - Smith Rank	Negative Ranks	1[a]	5.00	5.00
	Positive Ranks	8[b]	5.00	40.00
	Ties	1[c]		
	Total	10		

a. Jones Rank < Smith Rank
b. Jones Rank > Smith Rank
c. Smith Rank = Jones Rank

Test Statistics[b]

	Jones Rank - Smith Rank
Z	-2.333[a]
Asymp. Sig. (2-tailed)	.020

a. Based on negative ranks.

b. Wilcoxon Signed Ranks Test

7. For the problem above the null and alternative hypothesis are spelled out below:

H_{null}: There will be no difference in the rankings of Dr. Smith and Dr. Jones by the faculty.

H_{alt}: There will be a difference in the rankings of Dr. Smith and Dr. Jones by the faculty.

8. **Interpretation and APA writing template for Results Above:**

A Wilcoxon matched pairs signed rank test was conducted to determine whether there was a difference in the ranking of two candidates by the faculty. Results of that analysis indicated that there was a significant difference in how the faculty ranked the candidates, $z = -2.33$, $p < .05$. The results indicate that Dr. Smith was the preferred candidate and received significantly more favorable rankings than Dr. Jones.

Kruskal-Wallis Test for Independent Samples

This test is similar to a oneway between subjects ANOVA. The dependent variable, however, is based upon ranks, or ordinal data. Thus, the study would have one independent variable with **three or more** levels. There would be different participants at each level of the independent variable and the dependent variable would be measured on an ordinal scale (or be ratio or interval scale data that was transformed into ranked data). Note the similarity of this test to that of the Mann-Whitney U. The difference in the present problem is that there are **more than two levels** of the independent variable. (When there are **3** or more levels of the independent variable, the Kruskal-Wallis is a more appropriate test).

For example, suppose you had a group of professional golfers from a) the senior tour, b) the LPGA or women's tour, and c) the men's regular tour. Suppose the golfers from these three tours all competed in a common tournament. You then record the finishing position of all the players in the tournament. You obtain the following data in which the numbers in each column are the finishing positions (ranks) of the golfer in the common tournament.

Name & Finishing Position of Player on LPGA Tour		Name & Finishing Position of Player on Senior Tour		Name & Finishing Position of Player on Regular Tour	
Lopez	**12**	Palmer	**7**	Woods	**8**
Inkster	**15**	Irwin	**5**	Lehman	**2**
Rankin	**10**	Floyd	**9**	Stewart	**4**
Sorenstam	**14**	Nicholas	**3**	Daly	**6**
Haynie	**13**	Player	**11**	Els	**1**

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.
   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure
5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Tour**
6. Click on the white cell in **Row 1** under the word **Label** and type in **Golfing Tour**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 1** under the word **Value**. The word none will appear along with a small grey box to the right.
   a. Click on the small grey box and a Value Labels window will appear
   b. Click on the white box next to the word **Value**, type in the number **1**
   c. Click on the white box next to the word **Value Label** and type in **LPGA Tour**
   d. Click on **Add** button: 1 = "LPGA Tour" will appear in bottom white box
   e. Click on the white box next to the word **Value**, type in the number **2**

f. Click on the white box next to the word **Value Label** and type in **Senior Tour**
g. Click on **Add** button: 2 = "Senior Tour" will appear in bottom white box also
h. Click on the white box next to the word **Value**, type in the number **3**
i. Click on the white box next to the word **Value Label** and type in **Regular** Tour
j. Click on **Add** button: 3 = "Regular Tour" will appear in bottom white box also
k. Click **OK**

8. Click on the white cell in **Row 2** under the word **Name** and type in the word **Finish**
9. Click on the white cell in **Row 2** under the word **Label** and type in **Finishing Position**. (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

10. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Tour** and Column 2 named **Finish**.
11. Enter the data for each of the 5 payers on the three tours as follows. Mouse to the top cell under the first column which is Tour and enter the following:

1 tab 12
1 tab 15
1 tab 10
1 tab 14
1 tab 13
2 tab 7
2 tab 5
2 tab 9
2 tab 3
2 tab 11
3 tab 8
3 tab 2
3 tab 4
3 tab 6
3 tab 1

> The ones, twos, and threes in the first column are the codes for which tour the golfer is on where 1 = LPGA Tour, 2 = Senior Tour, and 3 = Regular Tour. The numbers in the second column represent the golfer's finishing position in the golf tournament.

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **Non-Parametric** Tests then
   b. Click on **K Independent Samples**
2. Highlight the dependent variable which is **finish** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Test Variable List** box
3. Highlight the independent variable which is **Tour** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Group Variable** Box. The following should then appear **Tour [? ?]**
4. Click on **Define** Groups button
   a. Type in a **1** in the **Minimum** box
   b. Click on the **Maximum** box and enter a **3**
   c. Click **Continue** button
5. Click on White square next to **Kruskal-Wallis** to place a check mark in the box if one is not already there
6. Click **OK.** Doing this will result in analysis being conducted. These results are below.

Ranks

	Golfing Tour	N	Mean Rank
Finishing Position	LPGA	5	12.80
	Senior	5	7.00
	Regular	5	4.20
	Total	15	

Test Statistics[a,b]

	Finishing Position
Chi-Square	9.620
df	2
Asymp. Sig.	.008

a. Kruskal Wallis Test

b. Grouping Variable: Golfing Tour

7. For the problem above the null and alternative hypothesis are spelled out below:

H_{null}: There will be no difference in the finishing rank positions of professional golfers on the regular, senior and LPGA tour when playing in a common tournament.

H_{alt}: There will be a difference in the finishing rank positions of professional golfers on the regular, senior, and LPGA tour when playing in a common tournament.

8. **Interpretation and APA writing template for Results Above:**

A Kruskal-Wallis test was conducted to determine whether the finishing position of golfers in a common tournament varied as a function of whether they normally played on the regular, seniors, or LPGA tour. Results of that analysis indicated that whether the golfer was on the regular, senior, or LPGA tour was related to their finishing position in a common tournament, $\_^2$ (2) = 9.62, $p < .05$. A post hoc rank sums test indicated that players on the LPGA finished significantly lower than either players on the senior tour, $z = -2.40$, $p < .05$, or the regular tour, $z = -2.61$, $p < .05$. However, players on the senior and regular tour did not differ significantly from one another in terms of finishing positions, $z = -1.35$, $p > .05$.

Friedman Test

This test is similar to a oneway repeated measures ANOVA, however, the data on the dependent variable is measured on an ordinal scale. The test assumes the study involves one independent variable, and that the same participants are repeatedly observed under **three or more** conditions. Also, the present test bears some resemblance to the Wilcoxon matched pairs signed rank test. However, the Wilcoxon involves one independent variable with **two and only two levels** and the participants in the study are in both conditions. The present test also involves only one independent variable with the **same** participants in **three or more** conditions of the study, and a dependent variable measured on an ordinal scale.

Suppose for example we want to find out if students have a preference for one type of soda over others. They are blindfolded and given a taste test. They are asked to take a sip of Brand X, Brand Y and Brand Z sodas and to **rank order** their preference for the three sodas where a 1 is the highest rank, a 2 the next highest and a 3 the least preferred soda. The data representing the rankings given by each participant to the three sodas are:

Participants' Rankings of the Three Brands of Soda

Participant	Brand X	Brand Y	Brand Z
Brooks	2	1	3
Dot	1	3	2
Ken	1	2	3
Pam	1	3	2
Gary	1	3	2
Laura	1	2	3
Ed	1	3	2
Cheryl	1	2	3
Dave	1	3	2
Ginny	2	1	3

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.
   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure
5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Brandx**
6. Click on the white cell in **Row 1** under the word **Label** and type in **Brand X Rank**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 2** under the word **Name** and type in the word **Brandy**
8. Click on the white cell in **Row 2** under the word **Label** and type in **Brand Y Rank**. (Doing this will provide you with a more expansive label in the results output).
9. Click on the white cell in **Row 3** under the word **Name** and type in the word **Brandz**

10. Click on the white cell in **Row 3** under the word **Label** and type in **Brand Z Rank**. (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

11. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Brandx,** Column 2 named **Brandy** and Column 3 named **Brandz**.

12. Enter the data for each of the 10 participants as follows. Mouse to the top cell under the first column which is Brandx and enter the following:

2 tab 1 tab 3
1 tab 3 tab 2
1 tab 2 tab 3
1 tab 3 tab 2
1 tab 3 tab 2
1 tab 2 tab 3
1 tab 3 tab 2
1 tab 2 tab 3
1 tab 3 tab 2
2 tab 1 tab 3

> The data may also be entered down one column at a time by entering all of the Brand X rankings first, then mousing to the second column and entering all of the Brand Y rankings, and then mousing to the third column and entering all of the Brand Z

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **Non-Parametric** Tests then
   b. Click on **K Related Samples**
2. Highlight **Brandx** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Test Variable** Box
3. Highlight **Brandy** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Test Variable** Box
4. Highlight **Brandz** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Test Variable** Box
5. If one the white square next **Friedman** is not already checked, click on it to place a check mark there
6. Click on **Statistics** button at bottom corner of screen
   a. Click on white square next to **Descriptives** to place a check mark in the box
   b. Click on **continue** button
7. Click **OK.** Doing this will result in analysis being conducted. These results are below.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Brand X Rank	10	1.2000	.42164	1.00	2.00
Brand Y Rank	10	2.3000	.82327	1.00	3.00
Brand Z Rank	10	2.5000	.52705	2.00	3.00

Ranks

	Mean Rank
Brand X Rank	1.20
Brand Y Rank	2.30
Brand Z Rank	2.50

Test Statistics[a]

N	10
Chi-Square	9.800
df	2
Asymp. Sig.	.007

a. Friedman Test

8. For the problem above the null and alternative hypothesis are spelled out below:

H_{null}: There will be no difference in the participants' rank ordered preferences for Brand X, Brand Y, or Brand Z sodas.

H_{alt}: There will be a difference in the participants' rank ordered preferences for Brand X, Brand Y, and Brand Z sodas.

9. **Interpretation and APA writing template for Results Above:**

A Friedman test was conducted to determine whether participants had a differential rank ordered preference for the three brands of soda. Results of that analysis indicated that there was a differential rank ordered preference for the three brands of soda, $\_^2$ (2) = 9.80, $p < .05$. A post hoc comparison of the rank ordered preferences for the three brands of soda was conducted using Nemenyi's ***** procedure. Results of this analysis indicated that there were significantly more favorable rankings of Brand X soda over either Brand Y or Brand Z, $p < .05$. There was, however, no significant difference in how participants evaluated Brand Y and Brand Z sodas.

(*) The option for conducting the Nemenyi test is not present in the SSPS procedure. This post test is conducted by hand. Refer to your textbook for how to conduct this test.

Cronbach Alpha

An industrial psychologist was interested in developing a global scale to reliably measure employee affective (evaluative) reactions to the procedures used by an affirmative action officer to implement the policy of affirmative action at a company. To develop the scale, the participants used in a test sample were asked to read a detailed description of the affirmative action procedures the officer planned to use. After reading these procedures, the employees used in the test sample were asked to indicate their affective reactions to the affirmative action officer's procedures by placing a check-mark along **each** one of the scale items listed below. For each of the six items below a check mark placed adjacent to the positive word of each pairing (pleased, satisfied, tolerant, favorable, like, and wise) was scored as a 7. A check mark next to each negative word (displeased, dissatisfied, intolerant, unfavorable, dislike, and unwise) was scored as a 1. Check marks placed in intermediate positions received intermediate numbers between 2 and 6. **The responses of Employee A are indicated below by the X marks**.

Item 1	pleased:	_X_:___:___:___:___:___:___:displeased
Item 2	dissatisfied:	___:___:___:___:___:_X_:___:satisfied
Item 3	tolerant:	___:___:___:___:___:___:_X_:intolerant
Item 4	unfavorable:	___:___:___:___:___:___:_X_:favorable
Item 5	like:	_X_:___:___:___:___:___:___:dislike
Item 6	unwise:	_X_:___:___:___:___:___:___:wise

The issue of interest to the industrial psychologist was whether these six items "hung" together and measured the same construct, namely, **affective** reactions to the actions taken by the affirmative action officer. If they did the psychologist could then add the scores of each participant in the study across each of the six items to come up with one total or global affective score. To determine whether one such global affective score could be computed the psychologist needed to calculate a statistic for the global scale known as Cronbach's Alpha. In order for the global affective scale to have good reliability, the Cronbach Alpha should minimally have a value of .7. The responses of ten test employees to each of the eight items are listed below:

Employee	Item1	Item2	Item3	Item4	Item5	Item6
A	**7**	**6**	**1**	**7**	**7**	**1**
B	6	7	1	5	3	1
C	5	6	3	6	4	1
D	4	6	5	4	3	2
E	3	5	3	2	3	2
F	2	4	2	3	4	1
G	1	2	4	1	1	1
H	7	4	5	6	5	1
I	6	5	2	7	6	1
J	2	5	6	5	7	1

1. Logon to system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click **OK** at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. The Data **View** tab will be used to actually enter the raw numbers listed above. (See pages 1-3 for a more detailed explanation of creating data files.)

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.
   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

5. Click on the white cell in **Row 1** under the word **Name** and type in the word **Item1**
6. Click on the white cell in **Row 1** under the word **Label** and type in **Pleased**. (Doing this will provide you with a more expansive label in the results output).
7. Click on the white cell in **Row 2** under the word **Name** and type in the word **Item2**
8. Click on the white cell in **Row 2** under the word **Label** and type in **Satisfied**. (Doing this will provide you with a more expansive label in the results output).
9. Click on the white cell in **Row 3** under the word **Name** and type in the word **Item3**
10. Click on the white cell in **Row 3** under the word **Label** and type in **Tolerant**. (Doing this will provide you with a more expansive label in the results output).
11. Click on the white cell in **Row 4** under the word **Name** and type in the word **Item4**
12. Click on the white cell in **Row 4** under the word **Label** and type in **Favorable**. (Doing this will provide you with a more expansive label in the results output).
13. Click on the white cell in **Row 5** under the word **Name** and type in the word **Item5**
14. Click on the white cell in **Row 5** under the word **Label** and type in **Like**. (Doing this will provide you with a more expansive label in the results output).
15. Click on the white cell in **Row 6** under the word **Name** and type in the word **Item6**
16. Click on the white cell in **Row 6** under the word **Label** and type in **Wise**. (Doing this will provide you with a more expansive label in the results output).

DATA ENTRY PHASE

17. Click on the **Data View** tab in the lower left corner. The data **view** screen will now appear with Column 1 named **Item1**, Column 2 named **Item2,** Column 3 named **Item3**, Column 4 named **Item4**, Column 5 named **Item5**, and Column 6 named **Item6.**
18. Enter the data for each of the 10 participants (employee A through J) as follows. Mouse to the top cell under the first column which is Item1 and enter the following:

7 tab 6 tab 1 tab 7 tab 7 tab 1
6 tab 7 tab 1 tab 5 tab 3 tab 1
5 tab 6 tab 3 tab 6 tab 4 tab 1
4 tab 6 tab 5 tab 4 tab 3 tab 2
3 tab 5 tab 3 tab 2 tab 3 tab 2
2 tab 4 tab 2 tab 3 tab 4 tab 1
1 tab 2 tab 4 tab 1 tab 1 tab 1
7 tab 4 tab 5 tab 6 tab 5 tab 1
6 tab 5 tab 2 tab 7 tab 6 tab 1
2 tab 5 tab 6 tab 5 tab 7 tab 1

> The data may also be entered one column at a time entering all the responses to item 1 first, and then entering all the responses to item 2, then item 3, then item 4, then item 5 and finally item 6.

Data Analysis

1. Click on **Analyze** at top of screen then
   a. Click on **Scale** then
   b. Click on **Reliability Analysis**
2. Highlight **item1, item2 item3, item4, item5**, and **item6** by clicking on item1 and **dragging the pointer down all items**. When all items are highlighted
   a. Click on **arrow >** to transfer all names to the **Item(s)** Box
3. In the **Model** Box make sure the word **Alpha** is there. If not click on down arrow and highlight alpha

4. Make sure a check mark is in the **List Items labels** box. If not click on white square.
5. Click on **Statistics** button
6. Place check marks in the white squares next to the following items by clicking on the white square
   a. **Descriptives** for **Item**
   b. Descriptives for **Scale**
   c. Descriptives for **Scale if Item Deleted**
7. Place check marks in the white squares next to the following items by clicking on the white square
   a. **Summaries** for **Means**
   b. Summaries for **Variances**
   c. Summaries for **Co-Variances**
   d. Summaries for **Correlations**
8. Place check marks in the white squares next to the following items by clicking on the white square
   a. **Inter-item Correlations**
   b. Inter-item **Co-Variances**
9. Click on **Continue** Button
10. Click **OK.** Doing this will result in analysis being conducted. These results are below.

```
 ****** Method 2 (covariance matrix) will be used for this analysis ******



  R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

  1.     ITEM1        pleased
  2.     ITEM2        satisfied
  3.     ITEM3        tolerant
  4.     ITEM4        favorable
  5.     ITEM5        like
  6.     ITEM6        wise

                            Mean        Std Dev       Cases

  1.     ITEM1            4.3000         2.2136        10.0
  2.     ITEM2            5.0000         1.4142        10.0
  3.     ITEM3            3.2000         1.7512        10.0
  4.     ITEM4            4.6000         2.0656        10.0
  5.     ITEM5            4.3000         1.9465        10.0
  6.     ITEM6            1.2000          .4216        10.0


                   Covariance Matrix

               ITEM1       ITEM2       ITEM3       ITEM4       ITEM5

ITEM1         4.9000
ITEM2         1.7778      2.0000
ITEM3        -1.5111      -.8889      3.0667
ITEM4         3.8000      1.6667      -.8000      4.2667
ITEM5         1.9000       .8889      -.0667      3.1333      3.7889
ITEM6         -.1778       .1111       .1778      -.3556      -.2889


               ITEM6

ITEM6          .1778



                   Correlation Matrix

               ITEM1       ITEM2       ITEM3       ITEM4       ITEM5
```

ITEM1	1.0000				
ITEM2	.5679	1.0000			
ITEM3	-.3898	-.3589	1.0000		
ITEM4	.8311	.5705	-.2212	1.0000	
ITEM5	.4410	.3229	-.0196	.7793	1.0000
ITEM6	-.1905	.1863	.2408	-.4082	-.3520

ITEM6

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Correlation Matrix

	ITEM6
ITEM6	1.0000

N of Cases = 10.0

Statistics for	Mean	Variance	Std Dev	N of Variables		
Scale	22.6000	36.9333	6.0773	6		
Item Means	Mean	Minimum	Maximum	Range	Max/Min	Variance
	3.7667	1.2000	5.0000	3.8000	4.1667	1.9387
Item Variances	Mean	Minimum	Maximum	Range	Max/Min	Variance
	3.0333	.1778	4.9000	4.7222	27.5625	2.9599
Inter-item Covariances	Mean	Minimum	Maximum	Range	Max/Min	Variance
	.6244	-1.5111	3.8000	5.3111	-2.5147	2.2587
Inter-item Correlations	Mean	Minimum	Maximum	Range	Max/Min	Variance
	.1333	-.4082	.8311	1.2393	-2.0357	.1881

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	**Alpha if Item Deleted**
ITEM1	18.3000	20.4556	.5782	.8657	.4373
ITEM2	17.6000	27.8222	.4766	.6903	.5222
ITEM3	19.4000	40.0444	-.2787	.4714	**.7776**
ITEM4	18.0000	17.7778	.8548	.9492	.2703
ITEM5	18.3000	22.0111	.6096	.7767	.4316
ITEM6	21.4000	37.8222	-.2057	.6528	**.6544**

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients   6 items

Alpha = .6087   Standardized item alpha = .4799

```
Reliability Coefficients     4 items

Alpha =   .8504  Standardized item alpha =   .8496
```

The Alpha of .8504 to the right of this box was obtained by going back to Step 2 above under Data Analysis and removing item3 and item6 from the**item(s) box**.

11. **Interpretation and APA writing template for Results Above:**

A scale was developed to measure employees' affective reactions to the procedures used by an affirmative action officer to implement a policy of affirmative action. A test sample of employees was asked to evaluate those procedures on a series of 7 point bi-polar scales. Initial scale items consisted of pleased-displeased, dissatisfied-satisfied, tolerant-intolerant, unfavorable-favorable, like-dislike, and unwise-wise. The Cronbach Alpha for these six items was only .6087. An inspection of the data analysis indicated that scale reliability could be improved by eliminating the tolerant-intolerant, and unwise-wise sub-scales. A re-analysis with these two items removed from the final scale indicated that scale reliability measurably improved, Cronbach Alpha = .8504 and reached conventional standards for scale reliability. Thus, the final scale used to measure employee affective reactions to the company's affirmative action procedures consisted of the sum total of an employee's responses across the scale items of pleased-displeased, dissatisfied-satisfied, unfavorable-favorable, and like-dislike.

Putting it all Together
Creating Master Data Sets &
Conducting ***Many*** Statistical Analyses

Our procedure thus far in the manual has been to provide examples of studies involving only one dependent variable, and only one or two independent variables. Also the researcher in each of the examples thus far was interested in answering only one research question. Thus, each of the examples thus far has called for only one statistical test to be conducted. And the set up of the procedures for conducting that singular statistical test has been provided.

Most researchers, however, collect information on a multitude of variables for each subject and then put the data into a **master data set**. Then the researcher after conducting the statistical test to answer the **main** research question of interest will sit back and generate a number of supplemental questions that might be answered by analyzing the data in the master data set. For example, a researcher may conduct a study that has two independent variables and has the participants randomly assigned to one of the four conditions generated by that design. The researcher may collect information on one main dependent variable of interest that was measured on a ratio or interval scale. Hence the researcher would conduct a 2 x 2 two way analysis of variance for that main analysis. However, in addition the researcher also may have collected a lot of supplement information on how the participant behaved on other dependent variables. Rather than putting the data into a number of **separate** data files, the researcher puts all of the information for each participant in **one main master data file**. The first step for analyzing the data would be the labeling and identification of each of the variables in the master data set. There may be a multitude of variable labels, one for each column of numbers in the master data set. For example:

A social psychologist was interested in determining whether people were more likely to be aggressive when frustrated than when not frustrated. The psychologist was also interested in finding out if conditions of anonymity were more or less likely to facilitate people being aggressive if and when they are frustrated. In order to answer this question the social psychologist took a sample of 40 participants and randomly assigned them to one of four experimental treatments. Half of the participants (20) were randomly assigned to a condition where they were given an impossible task to solve (and hence frustrated). The other half of the participants (20) were randomly assigned to a condition where they were given a solvable problem (and hence not frustrated). After encountering the task, the experimenter asked each participant to indicate the extent to which they were angry on a 7 point anger scale that looked like that below. Specifically each participant was asked to place a check mark somewhere along the following scale that best represented the degree of anger they were feeling as a result of working on the problem. The response of participant #1 whose responses are listed in the table on the next page are presented below:

not at all angry:__ __ __ __ __ __ _x_:very angry

The experimenter scored a check mark adjacent to the not at all angry end of the scale as a 1 and a check mark adjacent to the very angry end of the scale as a 7.

All participants in the study were then put into a situation where they had an opportunity to evaluate the quality of performance of an experimental confederate. In particular the experimenter informed the participants that they were to provide feedback to another subject (actually a confederate) who had been asked to create a humorous essay. The real participant's task was to provide feedback to the confederate as to the quality of the humorous essay. Feedback was to be given in the form of administering shock if they thought the essay was of poor quality and no shock if they thought the essay was of good quality. Half of the participants when giving the feedback did so under conditions of anonymity and the other half under conditions of no anonymity. The experimenter simply recorded the participant's response on a dichotomous yes/no shock scale and arbitrarily assigned the number 1 if the participant administered shock and the number 2 if the participant did not.

Shock Yes _x_ Shock No ___

Again, the responses of participant # 1 are listed in the shock column of the table below. In addition to observing whether the participant shocked or didn't shock the confederate, the experimenter also recorded the **duration** of the shock administered in terms of milliseconds, as well as the **intensity** of the shock administered in terms of volts.

Duration Milliseconds: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15: Duration Milliseconds

Volts: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30: Volts

The data for each participant is recorded in the table below. Thus participant # 1 did administer shock (scored as a 1), for a duration of 5 milliseconds, at an intensity of 20 volts. This participant also indicated that they were very angry (scored as a 7).

Column 1 **Anonymous** | **Column 2** **Not Anonymous**

Frustrated Row 1

Column 1 – Anonymous

Subject #	Shock	Duration	Intensity	Anger
1	1	5	20	7
2	2	0	0	5
3	1	4	19	6
4	1	5	23	6
5	1	6	10	7
6	1	5	24	5
7	2	0	0	4
8	1	3	15	3
9	1	4	19	6
10	1	7	35	9

Column 2 – Not Anonymous

Subject #	Shock	Duration	Intensity	Anger
21	1	4	15	6
22	1	1	2	3
23	2	0	0	3
24	2	0	0	2
25	2	0	0	4
26	2	0	0	7
27	1	4	14	4
28	2	0	0	7
29	1	2	6	8
30	2	0	0	5

Not Frustrated Row 2

Anonymous

Subject #	Shock	Duration	Intensity	Anger
11	2	0	0	2
12	2	0	0	1
13	2	0	0	2
14	2	0	0	1
15	1	2	10	3
16	1	3	12	4
17	1	2	10	3
18	1	1	7	2
19	2	0	0	1
20	1	0	0	1

Not Anonymous

Subject #	Shock	Duration	Intensity	Anger
31	2	0	0	2
32	2	0	0	1
33	1	1	7	2
34	2	0	0	1
35	2	0	0	3
36	2	0	0	2
37	2	0	0	1
38	2	0	0	1
39	2	0	0	2
40	1	2	10	4

We
are going to use **all** of the data from this experiment to create one master data file. Then we are going to ask a number of different questions about the data which call for different statistical analyses.

1. To create your master **data** file for the experiment first create a **paper** version template of the data on a sheet of paper that looks like that below.
2. These column of numbers refer respectively to: a) subject #; b) shock response; c) duration of shock; d) intensity of shock; e) anger of subject; f) the row level number of the experimental frustration condition the subject was in where 1 = frustrated condition and 2 = not frustrated condition; and finally g) the column number of the experimental anonymity condition the subject was in where 1 = anonymous condition and 2 = the not anonymous condition.

Subject	Shock	Duration	Intensity	Anger	Frustration	Anonymity

1	**1**	**5**	**20**	**7**	**1**	**1**
2	**2**	**0**	**0**	**5**	**1**	**1**
3	**1**	**4**	**19**	**6**	**1**	**1**
4	**1**	**5**	**23**	**6**	**1**	**1**
5	**1**	**6**	**30**	**7**	**1**	**1**
6	**1**	**5**	**24**	**5**	**1**	**1**
7	**2**	**0**	**0**	**4**	**1**	**1**
8	**1**	**3**	**15**	**3**	**1**	**1**
9	**1**	**4**	**19**	**6**	**1**	**1**
10	**1**	**7**	**35**	**9**	**1**	**1**
11	**2**	**0**	**0**	**2**	**2**	**1**
12	**2**	**0**	**0**	**1**	**2**	**1**
13	**2**	**0**	**0**	**2**	**2**	**1**
14	**2**	**0**	**0**	**1**	**2**	**1**
15	**1**	**2**	**10**	**3**	**2**	**1**
16	**1**	**3**	**12**	**4**	**2**	**1**
17	**1**	**2**	**10**	**3**	**2**	**1**
18	**1**	**1**	**7**	**2**	**2**	**1**
19	**2**	**0**	**0**	**1**	**2**	**1**
20	**1**	**0**	**0**	**1**	**2**	**1**
21	**1**	**4**	**15**	**6**	**1**	**2**
22	**1**	**1**	**2**	**3**	**1**	**2**
23	**2**	**0**	**0**	**3**	**1**	**2**
24	**2**	**0**	**0**	**2**	**1**	**2**
25	**2**	**0**	**0**	**4**	**1**	**2**
26	**2**	**0**	**0**	**7**	**1**	**2**
27	**1**	**4**	**14**	**4**	**1**	**2**
28	**2**	**0**	**0**	**7**	**1**	**2**
29	**1**	**2**	**6**	**8**	**1**	**2**
30	**2**	**0**	**0**	**5**	**1**	**2**
31	**2**	**0**	**0**	**2**	**2**	**2**
32	**2**	**0**	**0**	**1**	**2**	**2**
33	**1**	**1**	**7**	**2**	**2**	**2**
34	**2**	**0**	**0**	**1**	**2**	**2**
35	**2**	**0**	**0**	**3**	**2**	**2**
36	**2**	**0**	**0**	**2**	**2**	**2**
37	**2**	**0**	**0**	**1**	**2**	**2**
38	**2**	**0**	**0**	**1**	**2**	**2**
39	**2**	**0**	**0**	**2**	**2**	**2**
40	**1**	**2**	**10**	**4**	**2**	**2**

The **last two column of numbers** in the data set identify which row (frustration) level and which column (anonymity) level of the experiment the participant is in. The first column of numbers is the participant number, the second column whether shock was administered, the third column the duration of the shock, the fourth column the intensity of shock, and the fifth column the anger level of the participant.

Following a procedure similar to that described on pages 1-3 to create the computerized version of the above **paper** template:

1. Logon to the system
2. **Click Start > Programs > SPSS for Windows > SPSS 10.1 for Windows**. At this point a window will appear asking you what you would like to do. Click on the circle next to Type in Data (2nd option in list) and then click OK at the bottom of the window.
3. A Data Editor will appear. Look in the lower left corner of the screen. You should see a **Data View** tab and to the right of it a **Variable View** tab. The **Variable View** tab will be used first for the Data **Definition** Phase of creating a data file. This tab will be used to define the characteristics of the seven columns of numbers listed above in the **paper** template. The **Data** View tab will be used to actually enter the raw numbers listed above.

DATA DEFINITION PHASE

4. Click on the **Variable View** tab in the lower left corner. A new screen will appear with the following words at the top of each column.

   Name Type Width Decimals **Label** **Values** Missing Columns Align Measure

Unless otherwise specified in the manual or by your instructor, the only columns we will be using in this manual are the **Name** column, the **Label** column, and the **Values** column.

The **Name** column allows us to put a name at the top of the **computerized** version of our data set. It is, however, limited to no more than **eight** characters. Thus, although the **paper** version of the data set above has the names **Intensity, Frustration, and Anonymity** which are more than eight characters, the **computerized** version of the names will be shortened to **Intens, Frust,** and **Anon**.
The **Label** column allows us to expand the Name of any variable beyond eight characters but only for the computer print out of the results of our analysis. Thus, we can expand the word Intens to Intensity in the Label column and the word Frust to Frustration, and the word Anon to Anonymity. Thus, when we get a computer print out we will have the more informative words of Intensity, Frustration and Anonymity rather than the less informative words of Intens, Frust, and Anon.

The **Value** column allows us to attach meaning to the 1's and 2's for the shock, frustration and anonymity columns so that the computer "knows" that a 1 = "frustrated" and a 2 = "not frustrated" for the frustration column, or that a 1 = "anonymous" and a 2 = "not anonymous" for the anonymity column, or that a 1 = "yes shock was administered" or 2 = "no shock" for the shock column.

5. Click in the white cell in **Row 1** under the word **Name** and type in the word **Subject** (for the subject number) which is the name of the first column of numbers in the **paper** template.
6. Click in the white cell in **Row 1** under the word **Label** and type in Subject Number. (Doing this will provide you with a more expansive label in the computer print out of the results of your analysis.)
7. Click in the white cell in **Row 2** under the word **Name** and type in the word **Shock** (for Shock) which is the name of the second column of numbers in the paper template.
8. Click in the white cell in **Row 2** under the word **Label** and type in **Shock** (Doing this will provide you with a more expansive label in the computer print out of the results of your analysis).
9. Click in the white cell in **Row 2** under the word **Value**. The word none will appear along with a grey box to the right.
   a. Click on the small grey box and a value labels window will appear
   b. In the white box next to the word **Value**, type in the number **1.**
   c. Click on the white box next to the word **Value Label** and type in **Yes Shock**
   d. Click on the **Add** button. 1 = "Yes Shock" should now appear in the bottom white box.
   e. In the white box next to the word **Value** type in the number **2.**
   f. Click on the white box next to the word **Value Label** and type in **No Shock**
   g. Click on the **Add** button. 1 = "Yes shock" and
      2 = "No shock" should now appear in the bottom white box.
   h. Click **OK** button (top right corner of screen)
10. Click in the white cell in **Row 3** under the word **Name** and type in the word **Duration** which is the name of the third column of numbers in the **paper** version of the data template.
11. Click in the white cell in **Row 3** under the word **Label** and type in **Shock Duration**. (Doing this will provide you with a more expansive label in the computer print out of the results of your analysis.)
12. Click in the white cell in **Row 4** under the word **Name** and type in the word **Intens** (for Intensity) which is the name of the fourth column of numbers in the paper template.
13. Click in the white cell in **Row 4** under the word **Label** and type in **Intensity.** (Doing this will provide you with a more expansive label in the computer print out of the results of your analysis).
14. Click in the white cell in **Row 5** under the word **Name** and type in the word **Anger** which is the name of the fifth column of numbers in the **paper** version of the data template.
15. Click in the white cell in **Row 5** under the word **Label** and type in **Anger Level**. (Doing this will provide you with a more expansive label in the computer print out of the results of your analysis.)
16. Click in the white cell in **Row 6** under the word **Name** and type in the word **Frust** (for Frustration) which is the name of the sixth column of numbers in the paper template.
17. Click in the white cell in **Row 6** under the word **Label** and type in **Frustration** (Doing this will provide you with a more expansive label in the computer print out of the results of your analysis).

18. Click in the white cell in **Row 6** under the word **Value**. The word none will appear along with a grey box to the right.
    a. Click on the small grey box and a value labels window will appear
    b. In the white box next to the word **Value**, type in the number **1.**
    c. Click on the white box next to the word **Value Label** and type in **Frustrated**
    d. Click on the **Add** button. 1 = "Frustrated" should now appear in the bottom white box.
    e. In the white box next to the word **Value** type in the number **2.**
    f. Click on the white box next to the word **Value Label** and type in **Not Frustrated**
    g. Click on the **Add** button. 1 = "Frustrated" and
       2 = "Not Frustrated" should now appear in the bottom white box.
    h. Click **OK** button (top right corner of screen)
19. Click in the white cell in **Row 7** under the word **Name** and type in the word **Anon** (for Anonymity) which is the name of the seventh column of numbers in the paper template.
20. Click in the white cell in **Row 7** under the word **Label** and type in **Anonymity** (Doing this will provide you with a more expansive label in the computer print out of the results of your analysis).
21. Click in the white cell in **Row 7** under the word **Value**. The word none will appear along with a grey box to the right.
    a. Click on the small grey box and a value labels window will appear
    b. In the white box next to the word **Value**, type in the number **1.**
    c. Click on the white box next to the word **Value Label** and type in **anonymous**
    d. Click on the **Add** button. 1 = "anonymous" should now appear in the bottom white box.
    e. In the white box next to the word **Value** type in the number **2.**
    f. Click on the white box next to the word **Value Label** and type in **Not anonymous**
    g. Click on the **Add** button. 1 = "Anonymous" and
       2 = "Not anonymous" should now appear in the bottom white box.
    h. Click **OK** button (top right corner of screen)

DATA ENTRY PHASE

22. Click on the **Data View** Tab in the lower left corner. The data **view** screen will now appear with **Column 1** named **Subject** (for the Subject Number), **Column 2** named **Shock**, **Column 3** named **Duration**, **Column 4** named **Intens** (for Intensity), **Column 5** named **Anger**, **Column 6** named **Frust** (for the Frustration independent variable), and **Column 7** named **Anon** (for the Anonymity independent variable).
23. Enter the data for all **40 subjects** listed in the paper template as follows. Click the white cell at Row 1, Column 1 under **Subject** and enter:

1 tab 1 tab 5 tab 20 tab 7 tab 1 tab 1	then mouse to the second row and enter the responses of the second subject.
2 tab 2 tab 0 tab 0 tab 5 tab 1 tab 1	then mouse to the third row and enter the responses of the third subject etc.

Follow the same procedure to enter the responses of the remaining subjects. The data could also be entered down one column at a time and then moving on to the second column etc.

Data Analysis

Whenever a researcher collects data and records the data in a data set, other researchers may come along and raise research questions that may be answered by exploring the data set. Listed below are just a few of a series of questions one might pose about the above data set. Along with each question are the data analysis procedures one would use to answer that **specific** question and a reference to the location in the manual relevant to the statistical procedure used.

Question 1: Are people more likely to administer shock when they are frustrated than when not frustrated? This question calls for a chi-Square test. See Page ii and Pages 58-60.

1. Click on **Data** at top of screen then
   a. Click on **Weight Cases** then
   b. Click on **Circle** by Do **Not** Weight Cases (a dot will appear) then
   c. Click on **OK**
2. Click **Analyze** at top of screen then
   a. Click on **Descriptive Statistics** then
   b. Click on **Crosstabs**
3. Highlight **Shock** by clicking on it then
   a. Click on **arrow** > to transfer this name to the **Row(s)** box
4. Highlight **Frust** by clicking on it then
   a. Click on **arrow** > to transfer this name to the **Column(s)** box
5. Click on **Statistics** button at bottom of screen, then
   a. Click on white square next to **Chi-square**. This will put a check in the box.
6. Click **Continue** button
7. Click **Cells** button at bottom of screen, then
   a. Click on white squares next to Observed and Expected to put a check mark in the box if one is not already there then
8. Click **Continue** button
9. Click **OK.** Doing this will result in analysis being conducted

Question 2 Is there a relationship between the intensity of the shock administered and the duration of the shock? This question calls for a Pearson's Correlation. See Page i and Pages 10-12.

1. Click on **Analyze** at top of screen then
   a. Click on **Correlate** then
   b. Click on **bi-variate**
2. Highlight the word **intens** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Variables** box
3. Highlight the word **duration** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Variables** box
4. Make sure there is a check mark in the small white box next to the word **Pearson**. If not click on the small white box and a check mark should appear
5. Click on **OK.** Doing this will result in analysis being conducted.

Question 3 Do the anonymous people administer shocks of a longer duration than the people who are not anonymous? This question calls for an independent groups t-test. See Page i and Pages 4-6.

1. Click on **Analyze** at top of screen then
   a. Click on **compare means** then
   b. Click on **Independent Samples t-test**
2. Highlight the word **Anon** by clicking on it and then
   a. Click on the **lower** arrow to transfer it to the **grouping** variable box. This is your independent variable in the question.
   b. When the **anon ??** shows up click on the **Define Groups** box
   c. Type in **1** in Group 1 box
   d. Type in **2** in Group 2 box
   e. Click the **Continue** button
3. Highlight the word **duration** by clicking on it and then
   a. Click on the **upper** arrow to transfer it to the **Test Variable** Box This is your dependent variable in the question.
4. Click **OK** Doing this will result in analysis being conducted.

Question 4 Does the participant's level of anonymity interact with their level of frustration to influence their level of expressed anger? This question calls for a 2 x 2 ANOVA since there are two independent variables (anonymity and frustration) in the question and the dependent variable in the question is measured on an interval scale. See page ii and Pages 37-41.

1. Click on **Analyze** at top of screen then
   a. Click on **General Linear Model** then
   b. Click on **Univariate**
2. Highlight the word **anger** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Dependent** Box
3. Highlight the word **Anon** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Fixed Factor(s)** Box.
4. Highlight the word **Frust** by clicking on it then
   a. Click on **arrow >** to transfer this name to the **Fixed Factors(s)** Box.
5. Click on **Options** Button
   a. Highlight the word **Anon** by clicking on it then
   b. Click on **Arrow >** to transfer this name to the **Display Means Box**.
   c. Highlight the word **Frust** by clicking on it then
   d. Click on **Arrow >** to transfer this name to the **Display Means Box**.
   e. Highlight the words **anon*frust** by clicking on it then
   f. Click on **Arrow >** to transfer this name combination to the **Display Means Box**.
6. Click on white square next to the words **descriptive statistics** to put a check mark in the box
7. Click **Continue**
8. Click **OK** Doing this will result in analysis being conducted.

Question 5 **Within** the condition where participants are **both** frustrated and anonymous, is there a relationship between the level of anger expressed and the intensity of shock administered. This question calls for a Pearson's Correlation. See Pages i and Pages 10-12. However, the analysis will be performed **only** on the responses of the participants who are **both** frustrated and anonymous.

1. Click on **Data** at top of screen then
   a. Click on **Select Cases**
2. Click on 2nd Circle which is adjacent to **"If Condition is Satisfied"**
3. Click on **If** button
4. In white box type **Anon = 1 and Frust = 1**
5. Click **Continue** button
6. Click **OK**
7. Click on **Analyze** at top of screen then
   a. Click on **Correlate** then
   b. Click on **bi-variate**
8. Highlight the word **intens** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Variables** box
9. Highlight the word **anger** by clicking on it and then
   a. Click on **arrow >** to transfer this name to the **Variables** box
10. Make sure there is a check mark in the small white box next to the word **Pearson**. If not click on the small white box and a check mark should appear
11. Click on **OK.** Doing this will result in analysis being conducted.

Notice in the box above, Steps 1 through 6 are the procedures used in order to select specific cases of interest for conducting an analysis. Not all cases need to enter into an analysis. Thus in the steps 1 though 6 above, the researcher is limiting his/her analysis to the responses of subjects 1 through 10 on page 83. These are the subjects who are **both** frustrated and anonymous.

Computer Printout

Help save paper and **save yourself money**. Print out **only** those sections of the results output that you absolutely need. SPSS generates a lot of output, much of which may be unnecessary to answering the question of interest to you. Thus, two sets of instructions are provided below. At the time of this printing of the manual, students are allotted $30 in their printing account. For each page of output printed, your account will be debited 15 cents (thus you have a 200 page capability). Unnecessary printing will be charged to **your** account. When your account value hits zero, your printing capabilities are **terminated**. If that happens in order to have your printing capabilities reinstated, you must go to **Technology Business Services** at 105 Culkin Hall and purchase additional print dollars. They may be purchased in $5.00 increments.

1. First **put your name on your output** page by doing the following:
   a. Make sure the active window is the Output Window
   b. Click on Insert
   c. Click on **New Page Title** - a box will appear
   d. Type your name in the box and then
   e. Move the cursor just outside of the box and click left mouse button

2. **Short** Output Instructions - - to be used to get **only** those portions of the SPSS output file necessary to address your questions. Make sure the **Output** Window is the **active** window. Hold down the **Control** key and then mouse to those tables that you wish to print **(Including the Table which you just typed above and which contains your name)** and click on them. Continue holding the control key and mouse to additional tables that you are interested in printing, and click on them also. Then mouse to the icon for a printer (3rd icon in from left at top of screen) and click on it. When clicking on the print icon, a window will come up that lists the name of the printer (HP LaserJet 4000 Series PS). Click the OK button. In Mahar Hall, the laserjet printer is at the front of the room. Your printout will begin immediately and include a cover page which listed your username and the dollar balance of your printing account.

3. **Long** Output Instructions - - to be used to get a paper printout of everything in the output file. Make sure the **Output** Window is the **active** window. Mouse to the top left corner of the screen and click on File, then click on Print. Or mouse to the icon for a printer (3rd icon in from left at top of screen) and click on it. When clicking on the print icon, a window will come up that lists the name of the printer (HP LaserJet 4000 Series PS). Click the OK button. In Mahar Hall, the laserjet printer is at the front of the room. Your printout will begin immediately and include a cover page which listed your username and the dollar balance of your printing account.

Saving A Data (or Output) File to Disc on the A Drive

It is a wise idea to save the **data** file for any data set that you have. It is also a wise idea to save the results of any **output** file required for homework, lab or exam purposes. In order to save a **data** file, make sure that the **data** file is in the active window on the computer screen. In order to save an **output** file containing results of an analysis make sure that the **output** file is in the active window on the computer screen. To save a **data** file do the following:

1. Click **Files** (top left corner of screen) then
2. Click **Save As**---------a save data as window will then appear.
3. Click on the down arrow next to the SPSS open folder then
4. Mouse on the slide bar and move the slide bar up till you see the icon for **3 ½ Floppy (A:)**
   Make sure you have a 3 ½ disc inserted in the A drive then
5. Click on **3 ½ Floppy (A:)** then
6. Mouse to the white space next to **File Name:** type in the name you would like to give the file, e.g. homework1 or lab1 and then
7. Click on **Save** button

If you wish to save the **output** file from a statistical analysis follow the same procedure as above but **make sure** the **output** file is in the **active** window and visible on the computer monitor.

Exiting Spss for Windows

1. Click on **File** (top left corner of screen)
2. Click **Exit**
   a. You will be asked if you wish to save contents of output viewer - Click No assuming you don't want to save the results. Then
   b. You will be asked if you wish to save contents of data editor - Click No -***assuming you don't want to save the data, or if you already have saved the data.

Logging Off Computer

Be sure to log off the computer system when you are done with your work.
1. Click the **start** button in the lower left corner of the monitor. If the start button is not visible, use the mouse and position the arrow to the lower left hand corner of the screen and the start button will appear.
2. Click **log of your user name** and answer yes.

Sending E-Mail

Now that you have a computer account, you can do a multitude of interesting things. One is to send e-mail to your instructor or to fellow students who are working on a project with you.

Log on to the computer using the procedures described on page iv. When you get the system prompt do the following:

1. Type the word Pine and press return key.

2. You should get the following screen:

?	HELP -	Get help using Pine
C	COMPOSE MESSAGE -	Compose and send a message
I	MESSAGE INDEX -	View messages in current folder
L	FOLDER LIST -	Select a folder to view
A	ADDRESS BOOK -	Update address book
S	SETUP -	Configure Pine Options
Q	QUIT -	Leave the Pine program

3. Enter the letter C for compose and press return.

4. You get the following screen:
5. To :
   Cc :
   Attchmnt:
   Subject :
   ----- Message Text -----

6. Type in your instructor's e-mail address. For example:
   smith@oswego.edu and press enter a couple of times till cursor moves to Subject

7. Type in your message. For example:
   Dear Dr. Smith, My dog got run over, my 4th grandmother died, my car broke down and I will be unable to make today's exam on time. I will contact you during your office hours to see if you will solve all of my problems. Sincerely, John

8. Press **control x** to send the message. When you do this you will get a prompt that says <u>Send Message? (Y):</u> enter y for yes and press return.

9. A message will come across screen indicating mail is being sent and you will be returned to the mail menu above.

10. Enter **Q** to quit Pine. You will now get the main computer system prompt.

11. When in Pine press ? To get detailed help at any time. Look at the menu at the bottom of screen for getting out of help.