DATA ANALYSIS

THROUGH

SPSS

INFERENTIAL ANALYSIS

(A Text Tutorial)

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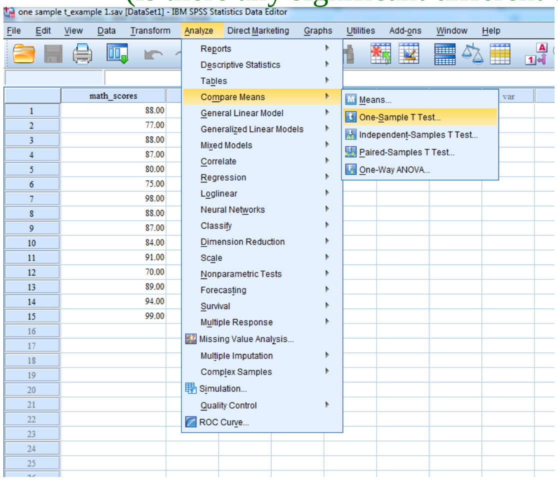
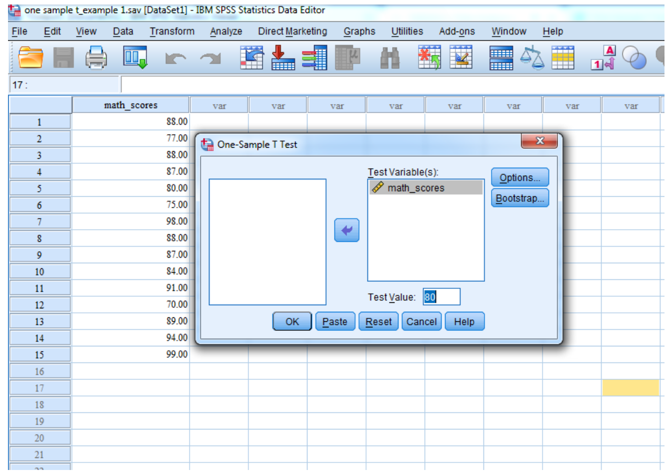
One Sample 't' test (Sample mean vs Population Mean)

Path

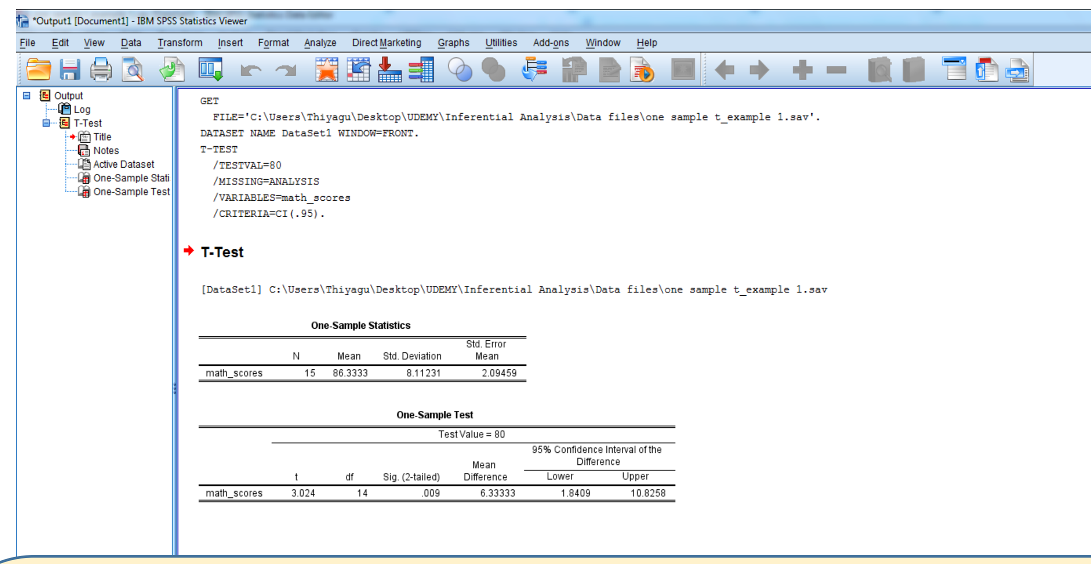
Analyse – compare means – one sample t test

(is there any significant different between sample mean and population mean)





(Population Mean μ =80)



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GET
  FILE='C:\Users\Thiyagu\Desktop\UDEMY\Inferential Analysis\Data files\one sample t_example 1.sav'.
DATASET NAME DataSet1 WINDOW=FRONT.
T-TEST
  /TESTVAL=80
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  /VARIABLES=math_scores
  /CRITERIA=CI(.95).
```

T-Test

[DataSet1] C:\Users\Thiyagu\Desktop\UDEMY\Inferential Analysis\Data files\one sample t_example 1.sav

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
math_scores	15	86.3333	8.11231	2.09459

One-Sample Test

	Test Value = 80					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
math_scores	3.024	14	.009	6.33333	1.8409	10.8258

Decision rule for assessing if the test is significant (for α = .05)

If p ≤ .05, the test is significant (the sample is significantly different than the population mean of μ = 80)

If p > .05, the test is not significant (the sample is not significantly different than the population mean of μ =80)

Written results in APA format

The students who took the new program scored significantly higher that the untreated population of μ = 80, t(14) = 3.02, p = .009

(can state p < .05 instead of p = .009, although p = .009 is more informative and therefore recommended)

Confidence Interval

- **If Zero is not** in the range of confident interval then it indicates that the test is **statistically significant**
- **If Zero** is in the range of confident interval then it indicates that the test is **not statistically significant.**

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
math_scores	15	86.3333	8.11231	2.09459

One-Sample Test

	Test Value = 80					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
math_scores	3.024	14	.009	6.33333	1.8409	10.8258

If it includes the value of 0 that means the test is not statistically significant. Otherwise (like interval not having 0) the test is statistically significant.

The interval is 1.84 to 10.82. And notice this does not include 0, therefore the test here was significant.

Effect Size

$$Cohen's - d = \frac{MeanDifference}{SD}$$

Cohen's d = 6.33 / 8.11 = .78

Cohen's guidelines for d

Small = .20, medium = .50 large =.80

Medium effect size (almost large)

Interpretation: students who took the new math program scored .78 standard deviations higher on the math exam (than the untreated population of μ)

Independent Sample 't' test

Path

Analyse – compare means – Independent Samples T Test

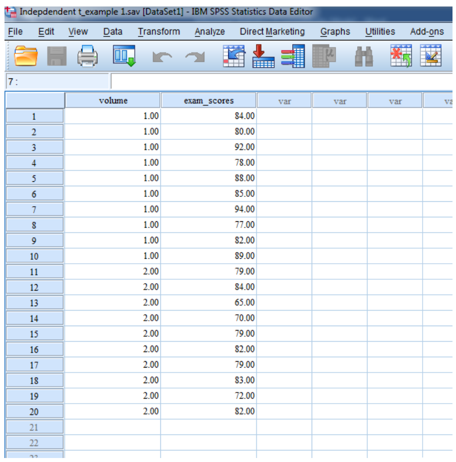
Comparing two groups – One test

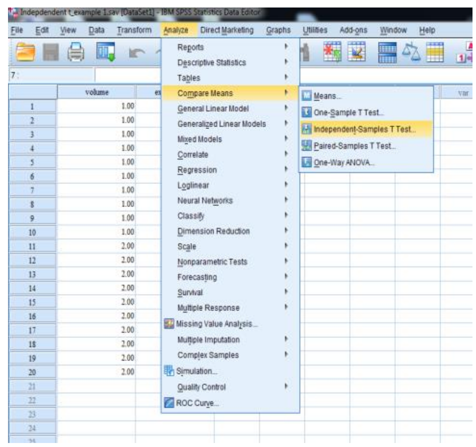
Independent Variable (Group):

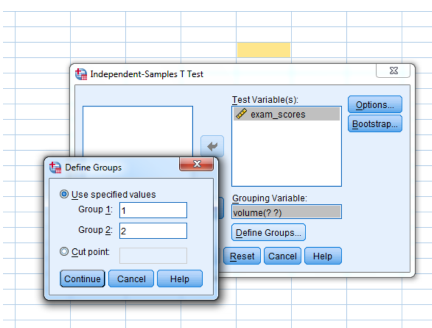
Categorical / Grouping / Discrete Variable (Nominal) (2 Groups only)

Dependent Variable (Test Variable) :

Continuous Variable (Interval / Ratio)







T-Test

[DataSet1] C:\Users\Thiyagu\Desktop\UDEMY\Inferential Analysis\Data files\Indepdendent t_example 1.sav

Group Statistics

	volume	N	Mean	Std. Deviation	Std. Error Mean
exam_scores	none (no music)	10	84.9000	5.80134	1.83455
	high volume	10	77.5000	6.34648	2.00693

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
exam_scores	Equal variances assumed	.078	.783	2.722	18	.014	7.40000	2.71907	1.68745	13.11255
	Equal variances not assumed			2.722	17.857	.014	7.40000	2.71907	1.68416	13.11584

Decision rule for Levene's Test (for α = .05)

If p ≤ .05, the variances is significantly different. Interpret the bottom row of result for t.

If p > .05, the variances are not significantly different. Interpret the top of results for t.

Decision rule for assessing if the test is significant (for α = .05)

If p ≤ .05, the test is significant (the test scores differ significantly for the two groups {like no volume and high volume groups / male and female groups})

If p > .05, the test is not significant (the test scores do not differ significantly for the two groups)

Written results in APA format

People who studies in a quiet condition performed significantly better on an exam than those who studies with music playing at a high volume, t (18) = 2.72, p = .014

Confidence Interval

- **If Zero is not** in the range of confident interval then it indicates that the test is **statistically significant**
- **If Zero** is in the range of confident interval then it indicates that the test is **not statistically significant.**

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
exam_scores	Equal variances assumed	.078	.783	2.722	18	.014	7.40000	2.71907	1.68745	13.11255
	Equal variances not assumed			2.722	17.857	.014	7.40000	2.71907	1.68416	13.11584

- In the above case, zero is not lies in the confidence interval, it means that the test is **statistically significant**

Effect Size

Cohen's Effect Size Table Cohen (1988) gave the following interpretation of d values that is still popular.

- Small d = 0.2 or 20% of σ
- Medium d = 0.5 or 50% of σ
- Large d = 0.8 or 80% of σ

Cohen's guidelines for d

Small = .20, medium = .50 large =.80

Formula for cohen's d:

$$d = t\sqrt{\frac{N_1 + N_2}{N_1 N_2}}$$

$$d = t\sqrt{\frac{N_1 + N_2}{N_1 N_2}}$$

$$d = 2.722\sqrt{\frac{10 + 10}{10x10}}$$

d =1.22

In the above case d is 1.22. indicates that:

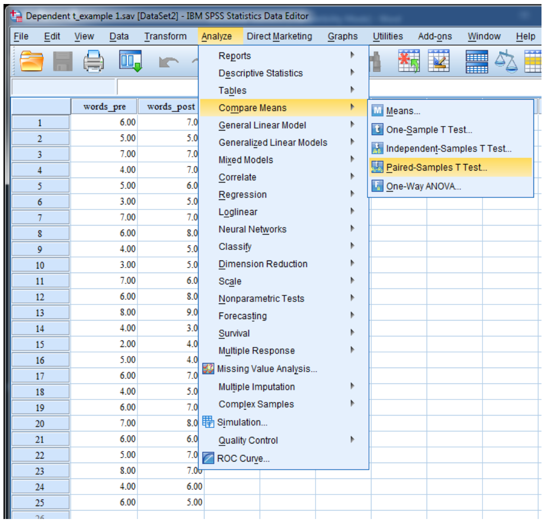
The students in the no volume condition scored 1.22 standard deviations higher on the exam than students in the high volume condition.

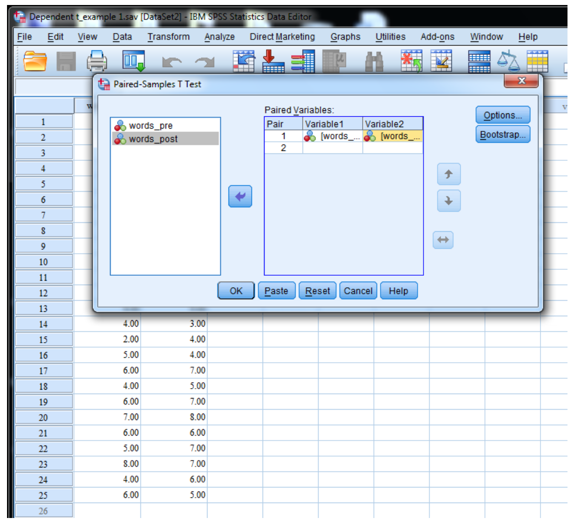
Dependent Sample 't' test

Path

Analyse – compare means – Paired Samples T Test

Comparing two test scores – Single Group





T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	words_pre	5.3600	25	1.57797	.31559
	words_post	6.1600	25	1.46287	.29257

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	words_pre & words_post	25	.696	.000

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference – Lower	95% Confidence Interval of the Difference – Upper			
Pair 1	words_pre - words_post	-.80000	1.19024	.23805	-1.29131	-.30869	-3.361	24	.003

<u>Decision rule for assessing if the test is significant (for α = .05)</u>

If $p \le .05$, the test is significant (the number of words recalled differs significantly from pre to post)

If $p > .05$, the test is not significant (the number of words recalled does not differ significantly from pre to post)

<u>Written results in APA format</u>

People recalled significantly more words after using the imagery task as compared to before using the task, $t(24) = 3.36$, $p = .003$.

(can state $p < .05$ instead of $p = .003$ if desired.)

Effect Size (Dependent Sample 't' test)

Cohen's Effect Size Table Cohen (1988) gave the following interpretation of d values that is still popular.

- Small d = 0.2 or 20% of σ
- Medium d = 0.5 or 50% of σ
- Large d = 0.8 or 80% of σ

Cohen's guidelines for d

Small = .20, medium = .50 large =.80

Formula for Cohen's d:

$$d = \frac{MeanDifference}{SD - of - the - difference}$$

$$d = \frac{-0.80}{1.19}$$

$$d = -0.67 or .67$$

D = .67

In the above case d is .67 indicates that:

The posttest values were .67 SD higher than the pretest use which has a medium effect. Cohen's standards that indicates a medium effect size or effect size that is modern in nature.

ANOVA (Analysis of Variance)

Path

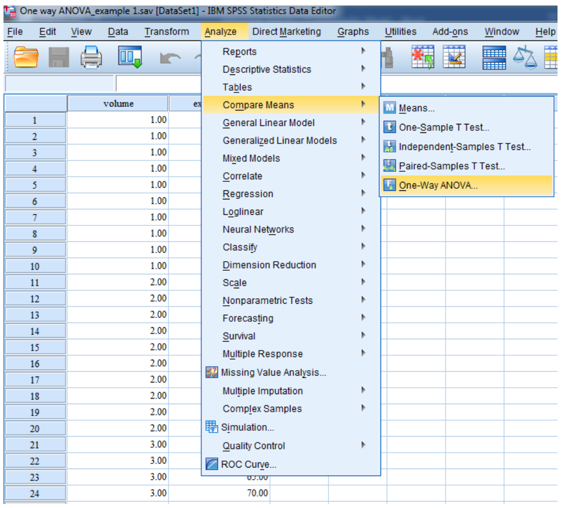
Analyse – compare means – One-way Anova

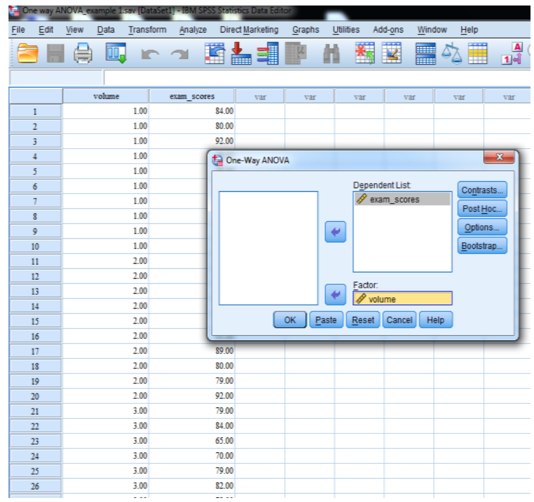
Independent Variable (Factor):

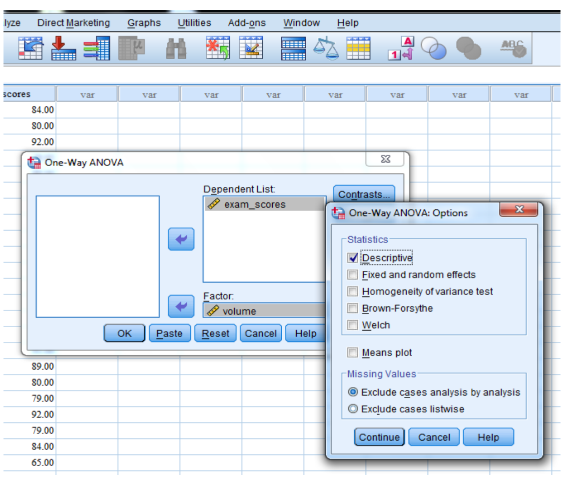
Categorical / Grouping / Discrete Variable (Nominal) (3 or more than three)

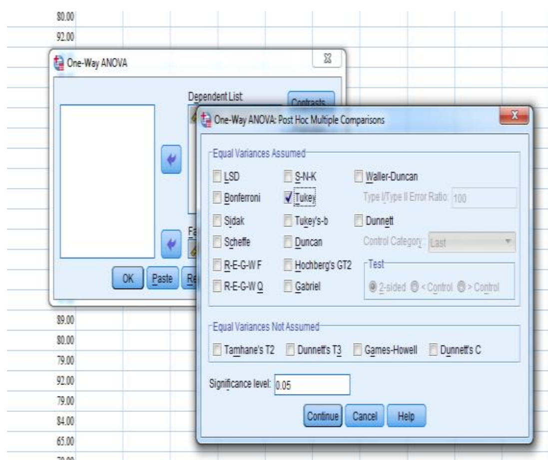
Dependent Variable (Dependent List):

Continuous Variable (Interval / Ratio)









Descriptives

exam_scores

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
none (no music)	10	84.9000	5.80134	1.83455	80.7500	89.0500	77.00	94.00
low volume	10	84.2000	5.86515	1.85472	80.0043	88.3957	78.00	92.00
high volume	10	77.5000	6.34648	2.00693	72.9600	82.0400	65.00	84.00
Total	30	82.2000	6.71796	1.22653	79.6915	84.7085	65.00	94.00

ANOVA

exam_scores

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	333.800	2	166.900	4.622	.019
Within Groups	975.000	27	36.111		
Total	1308.800	29			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: exam_scores
Tukey HSD

(I) volume	(J) volume	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
none (no music)	low volume	.70000	2.68742	.963	-5.9632	7.3632
	high volume	7.40000*	2.68742	.027	.7368	14.0632
low volume	none (no music)	-.70000	2.68742	.963	-7.3632	5.9632
	high volume	6.70000*	2.68742	.049	.0368	13.3632
high volume	none (no music)	-7.40000*	2.68742	.027	-14.0632	-.7368
	low volume	-6.70000*	2.68742	.049	-13.3632	-.0368

*. The mean difference is significant at the 0.05 level.

Decision rule for assessing if the test is significant (for α = .05)

If p ≤ .05, the test is significant (the test scores different significantly somewhere between the groups)

If p > .05, the test is not significant (the test scores do not differ significantly between the groups)

Written results in APA format

The level of volume of music played while studying had a significant impact on exam performance. $F(2, 27) = 4.62$, $p = .019$.

(can state $p < .05$ instead of $p = .019$, although reporting the exact p-value is more informative and therefore is recommended.)

ANOVA – POST HOC TEST

POST HOC TEST: Test conducted "after the fact". They are typically only conducted (interpreted) after a signficant ANOVA. Post hoc test are used to dive in and look for difference between groups, testing each possible pair of groups. The total alpha level used for the set of tests is .05 (for Tukey's test).

Post Hoc Tests

Multiple Comparisons

Dependent Variable: exam_scores
Tukey HSD

(I) volume	(J) volume	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
none (no music)	low volume	.70000	2.68742	.963	-5.9632	7.3632
	high volume	7.40000*	2.68742	.027	.7368	14.0632
low volume	none (no music)	-.70000	2.68742	.963	-7.3632	5.9632
	high volume	6.70000*	2.68742	.049	.0368	13.3632
high volume	none (no music)	-7.40000*	2.68742	.027	-14.0632	-.7368
	low volume	-6.70000*	2.68742	.049	-13.3632	-.0368

*. The mean difference is significant at the 0.05 level.

Homogeneous Subsets

exam_scores

Tukey HSD[a]

volume	N	Subset for alpha = 0.05: 1	Subset for alpha = 0.05: 2
high volume	10	77.5000	
low volume	10		84.2000
none (no music)	10		84.9000
Sig.		1.000	.963

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 10.000.

POST HOC TABLE FORMAT

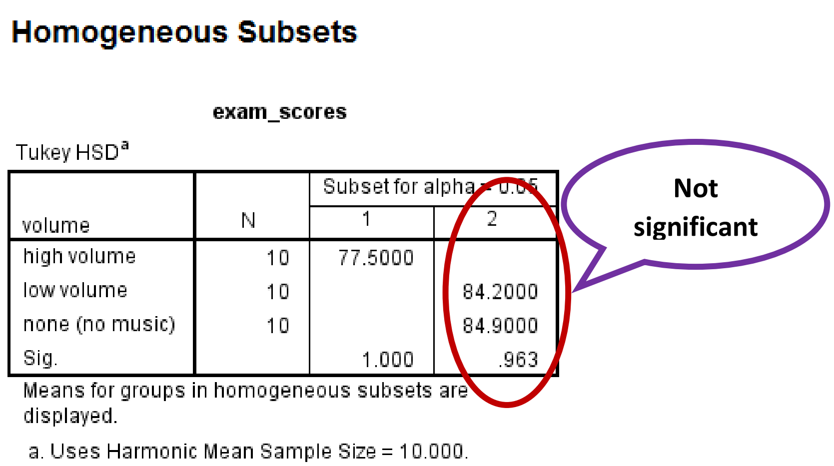
Mean		
None	**Low**	**High**
84.90	82.20	77.50

Multiple Comparision Table

Test	p-value	Significant
No musics vs. low volume	.963	No
No music vs high volume	.027	Yes (no > high)
Low volume vs high volume	.049	Yes (low > high)

Homogeneous Subsets Table

- Groups that share the same column are not significantly different
- Groups that do not share the same column are signficantly different



Homogeneous Subsets

exam_scores

Tukey HSD[a]

volume	N	Subset for alpha = 0.05	
		1	2
high volume	10	77.5000	
low volume	10		84.2000
none (no music)	10		84.9000
Sig.		1.000	.963

Means for groups in homogeneous subsets are displayed.

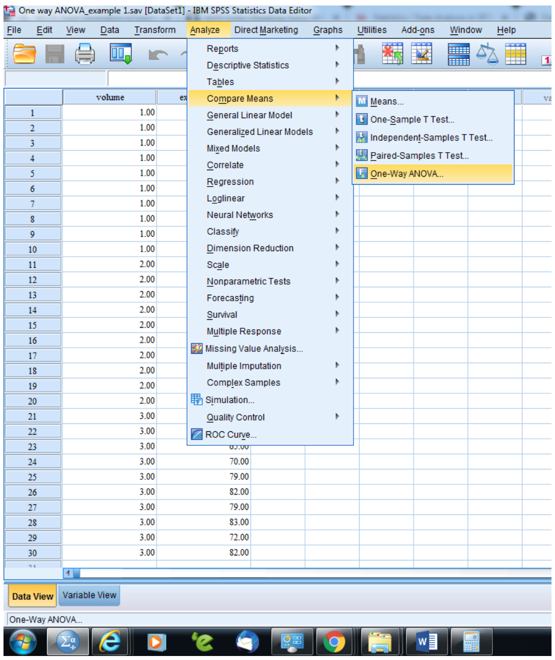
a. Uses Harmonic Mean Sample Size = 10.000.

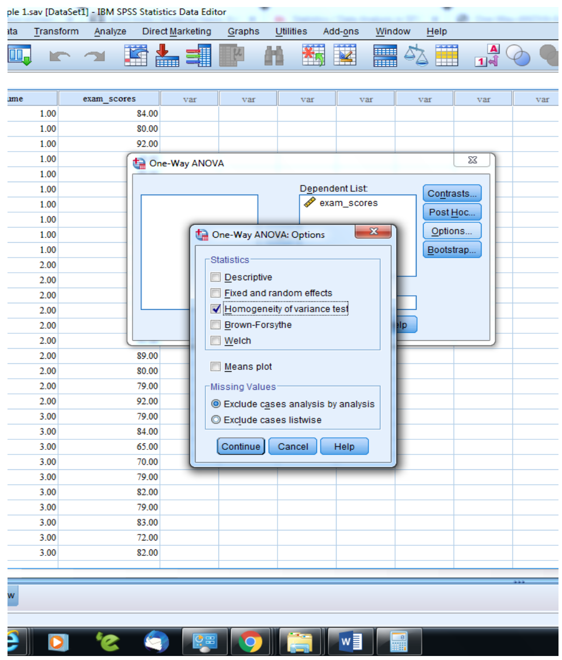
LEVENE'S EQUAL VARIANCE TEST

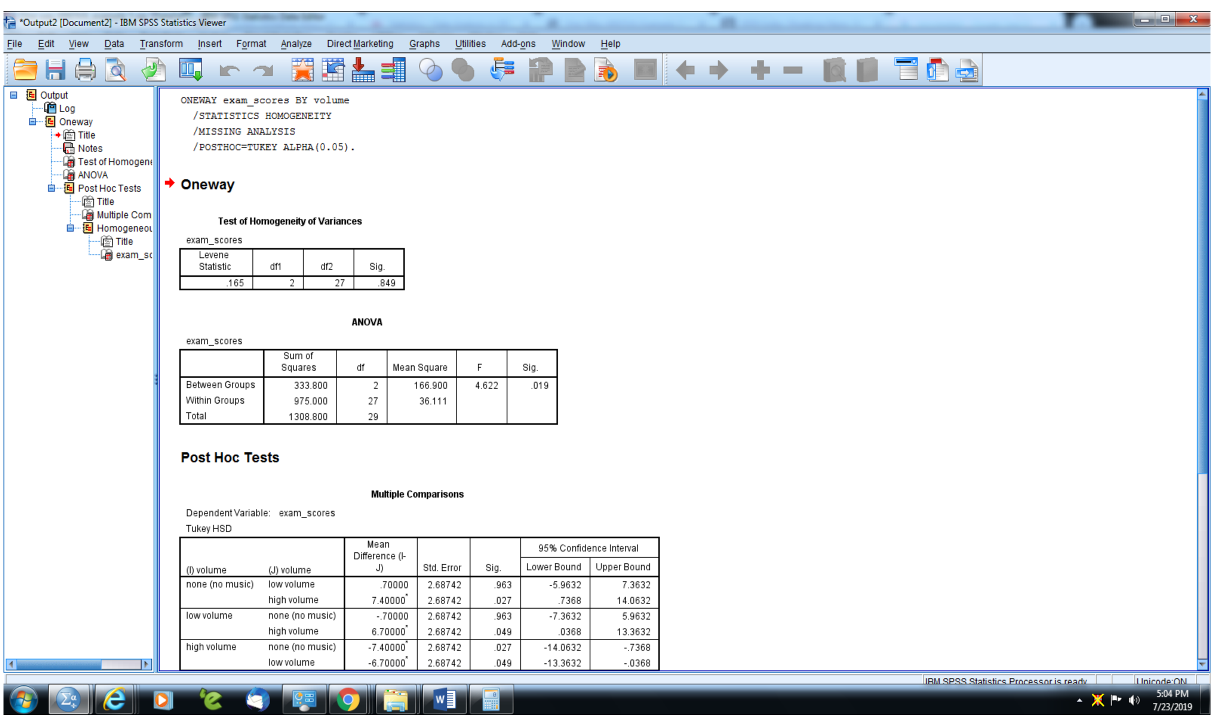
Path

Analyse – compare means – One-way Anova (Option – Homogeneity of variance test)

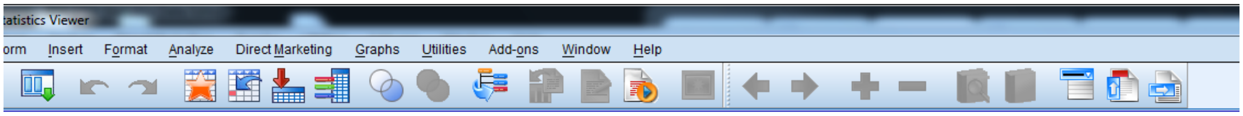
Levene's Test A homogeneity-of-variance test that is less dependent on the assumption of normality than most tests. For each case, it computes the absolute difference between the value of that case and its cell mean and performs a one-way analysis of variance on those differences.







RELATIONSHIP BETWEEN t-TEST and ANOVA (two groups only)



T-Test

```
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```

Group Statistics

	volume	N	Mean	Std. Deviation	Std. Error Mean
exam_scores	none (no music)	10	84.9000	5.80134	1.83455
	high volume	10	77.5000	6.34648	2.00693

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
exam_scores	Equal variances assumed	.078	.783	2.722	18	.014	7.40000	2.71907	1.68745	13.11255
	Equal variances not assumed			2.722	17.857	.014	7.40000	2.71907	1.68416	13.11584

```
ONEWAY exam_scores BY volume
  /MISSING ANALYSIS.
```

Oneway

ANOVA

exam_scores

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	273.800	1	273.800	7.407	.014
Within Groups	665.400	18	36.967		
Total	939.200	19			

$F = 7.407; t = 2.722$

$7.407 = 2.722 \times 2.722$

Therefore, with 2 groups

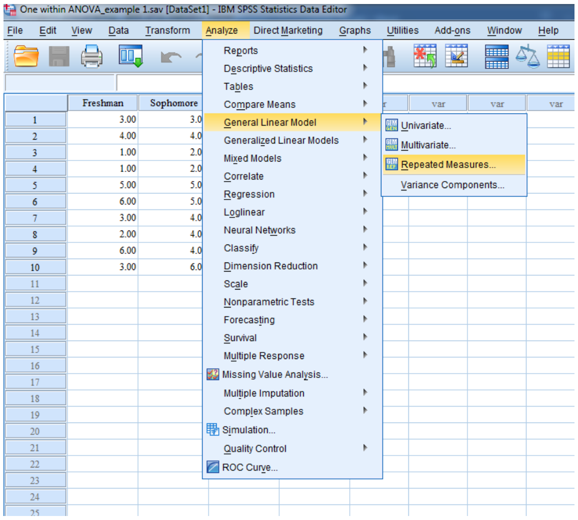
$$F = t^2$$

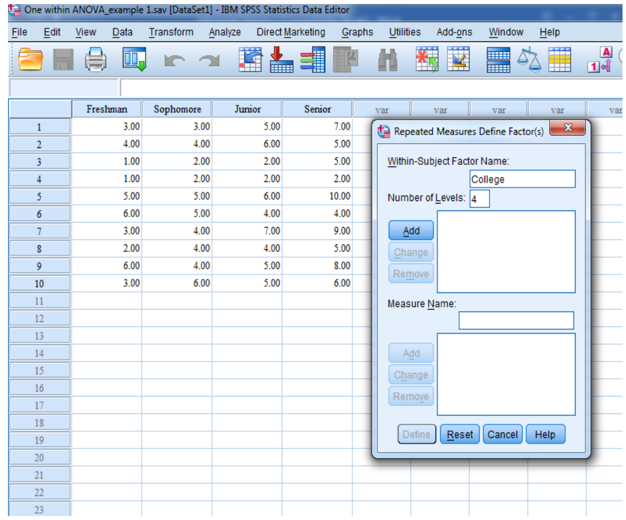
In other words, the one way ANOVA and t test are equivalent with two groups. they will provide the same answer or decison in terms of the hypothesis test (as they produce the exact same p-value); if your reject the null with the ANOVA, you will reject the null with the t-test. however, this propertly only applies with two groups.

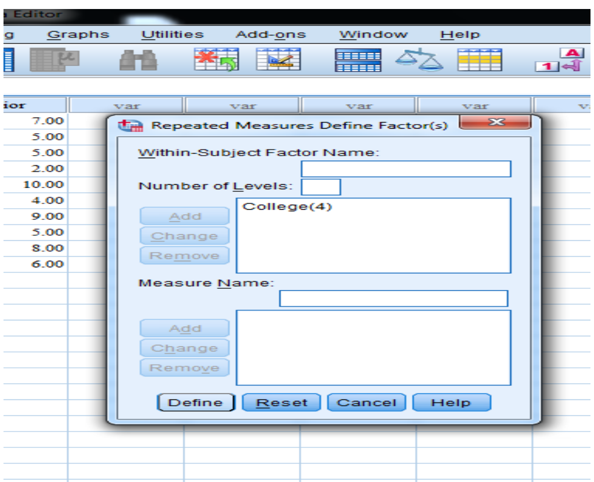
Within ANOVA / Repeated Measures ANOVA

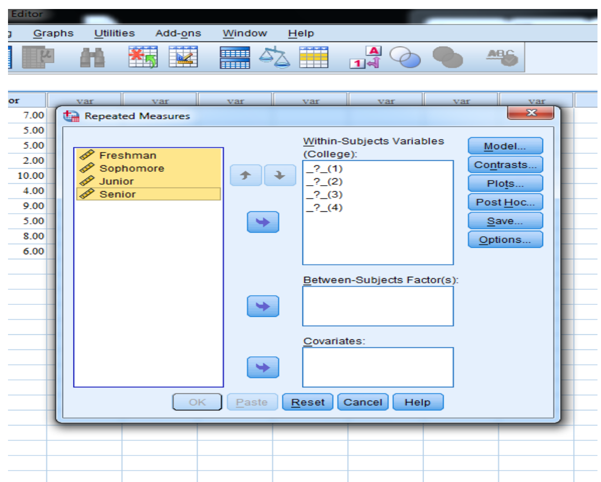
Path

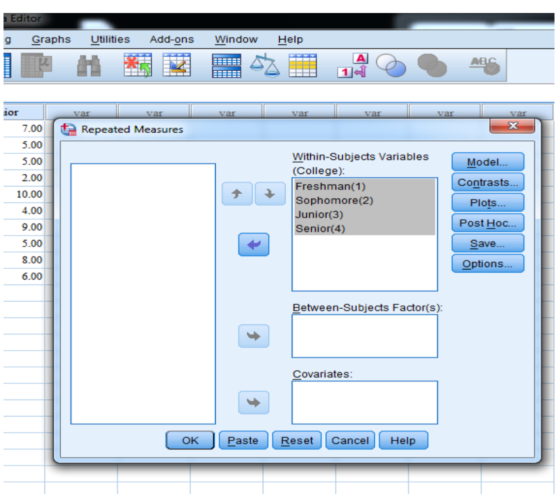
Analyse – General Linear Model – Repeated Measures

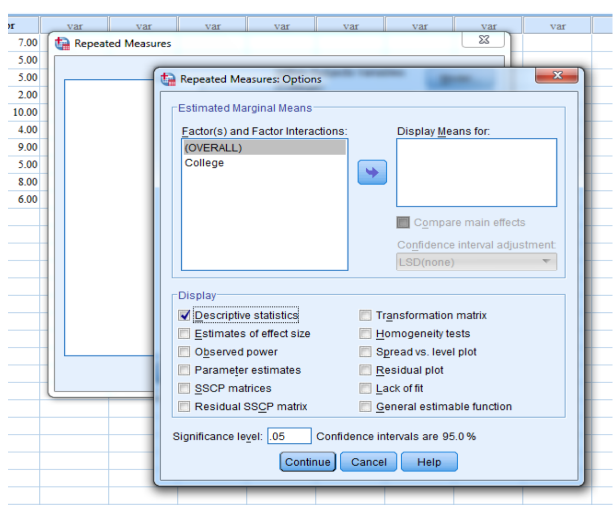


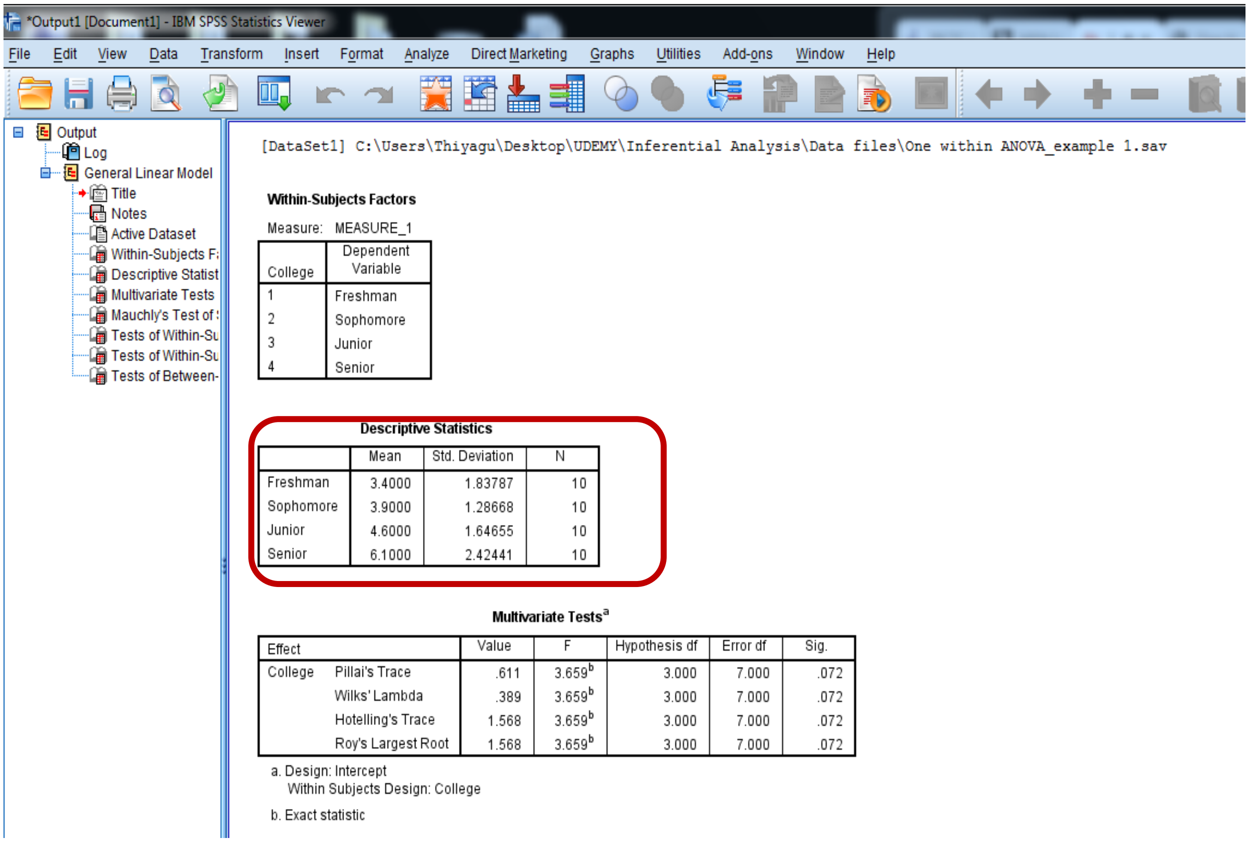












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Within-Subjects Factors

Measure: MEASURE_1

College	Dependent Variable
1	Freshman
2	Sophomore
3	Junior
4	Senior

Descriptive Statistics

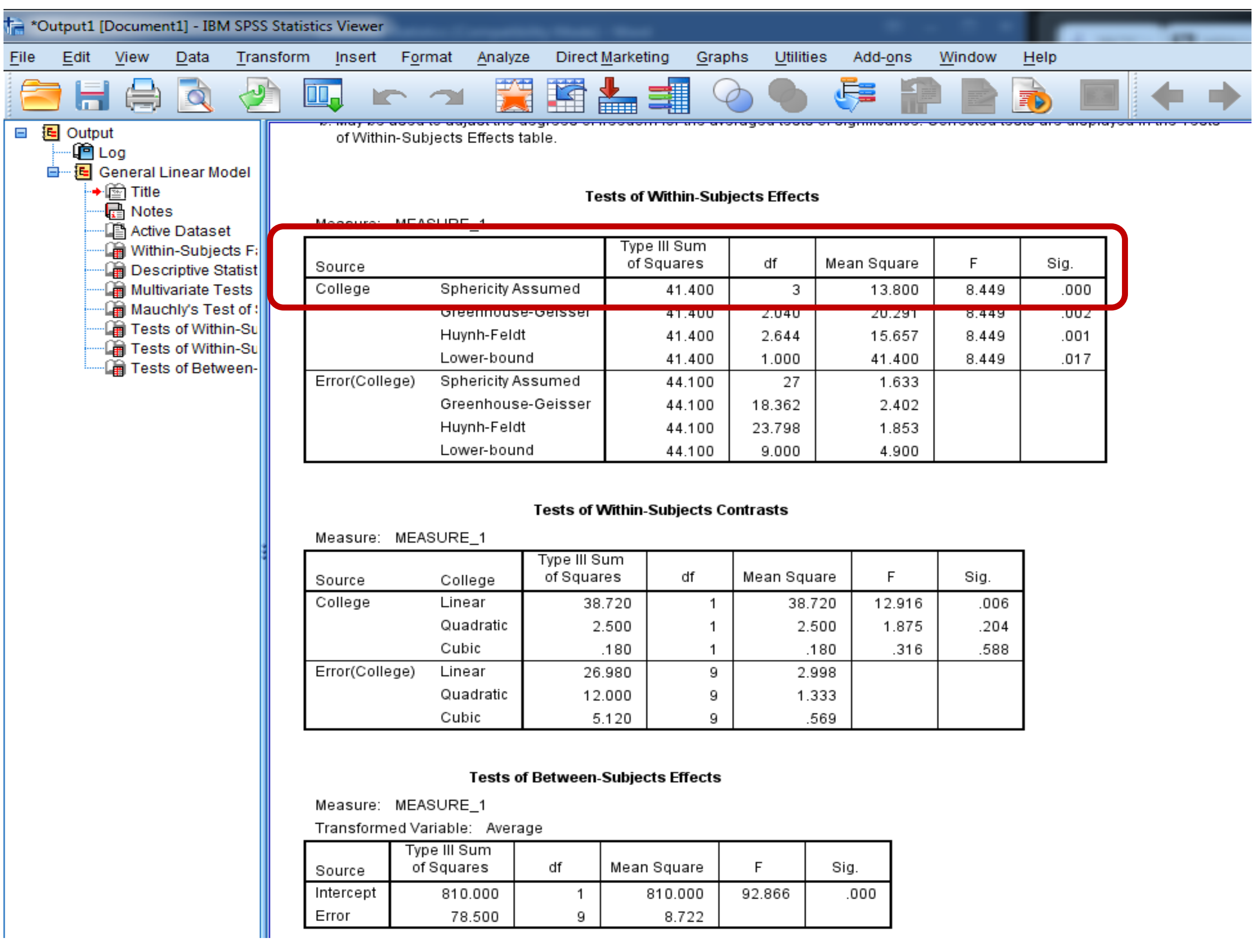
	Mean	Std. Deviation	N
Freshman	3.4000	1.83787	10
Sophomore	3.9000	1.28668	10
Junior	4.6000	1.64655	10
Senior	6.1000	2.42441	10

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
College	Pillai's Trace	.611	3.659[b]	3.000	7.000	.072
	Wilks' Lambda	.389	3.659[b]	3.000	7.000	.072
	Hotelling's Trace	1.568	3.659[b]	3.000	7.000	.072
	Roy's Largest Root	1.568	3.659[b]	3.000	7.000	.072

a. Design: Intercept
Within Subjects Design: College

b. Exact statistic



b. 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.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
College	Sphericity Assumed	41.400	3	13.800	8.449	.000
	Greenhouse-Geisser	41.400	2.040	20.291	8.449	.002
	Huynh-Feldt	41.400	2.644	15.657	8.449	.001
	Lower-bound	41.400	1.000	41.400	8.449	.017
Error(College)	Sphericity Assumed	44.100	27	1.633		
	Greenhouse-Geisser	44.100	18.362	2.402		
	Huynh-Feldt	44.100	23.798	1.853		
	Lower-bound	44.100	9.000	4.900		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	College	Type III Sum of Squares	df	Mean Square	F	Sig.
College	Linear	38.720	1	38.720	12.916	.006
	Quadratic	2.500	1	2.500	1.875	.204
	Cubic	.180	1	.180	.316	.588
Error(College)	Linear	26.980	9	2.998		
	Quadratic	12.000	9	1.333		
	Cubic	5.120	9	.569		

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	810.000	1	810.000	92.866	.000
Error	78.500	9	8.722		

Decision rule for assessing if the test is significant (for α = .05)

If p ≤ .05, the test is significant (attitudes towards e-texts were significantly different over the course of college)

If p > .05, the test is not significant (attitudes toward e-texts were not significantly different over the course of college)

Written results in APA format

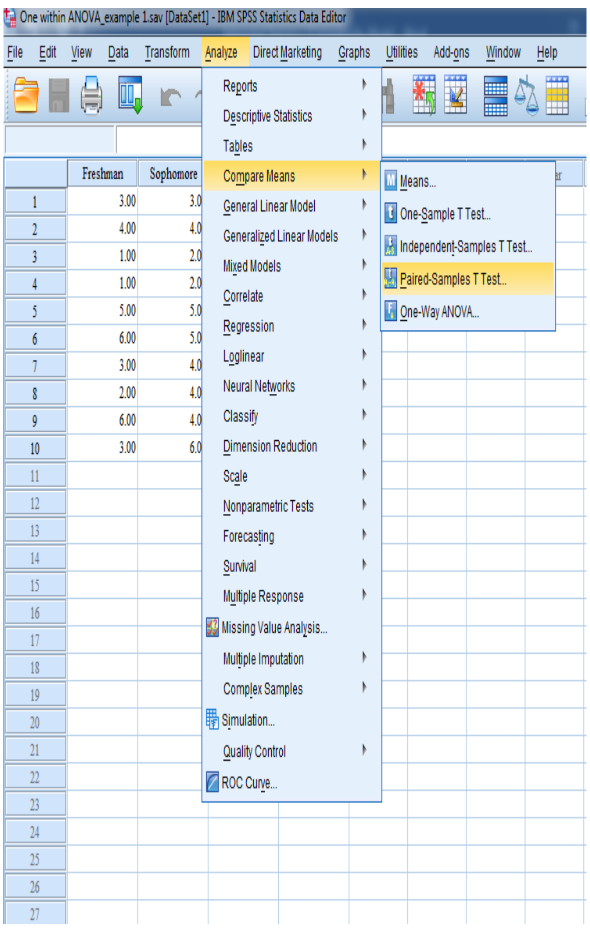
Students' openness to e-texts changed over time, F (3, 27) = 8.449, p = .000.

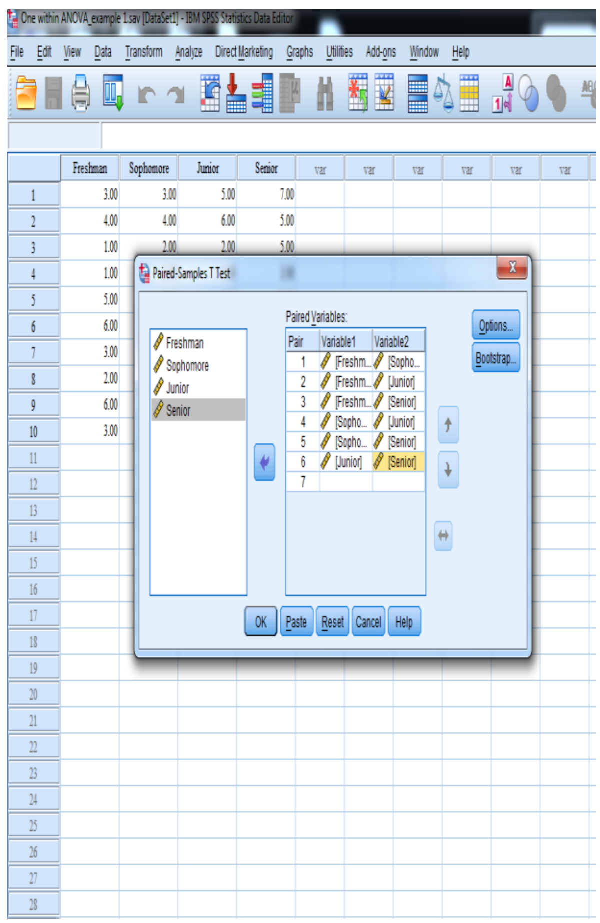
Within ANOVA / Repeated Measures ANOVA – POST HOC TEST

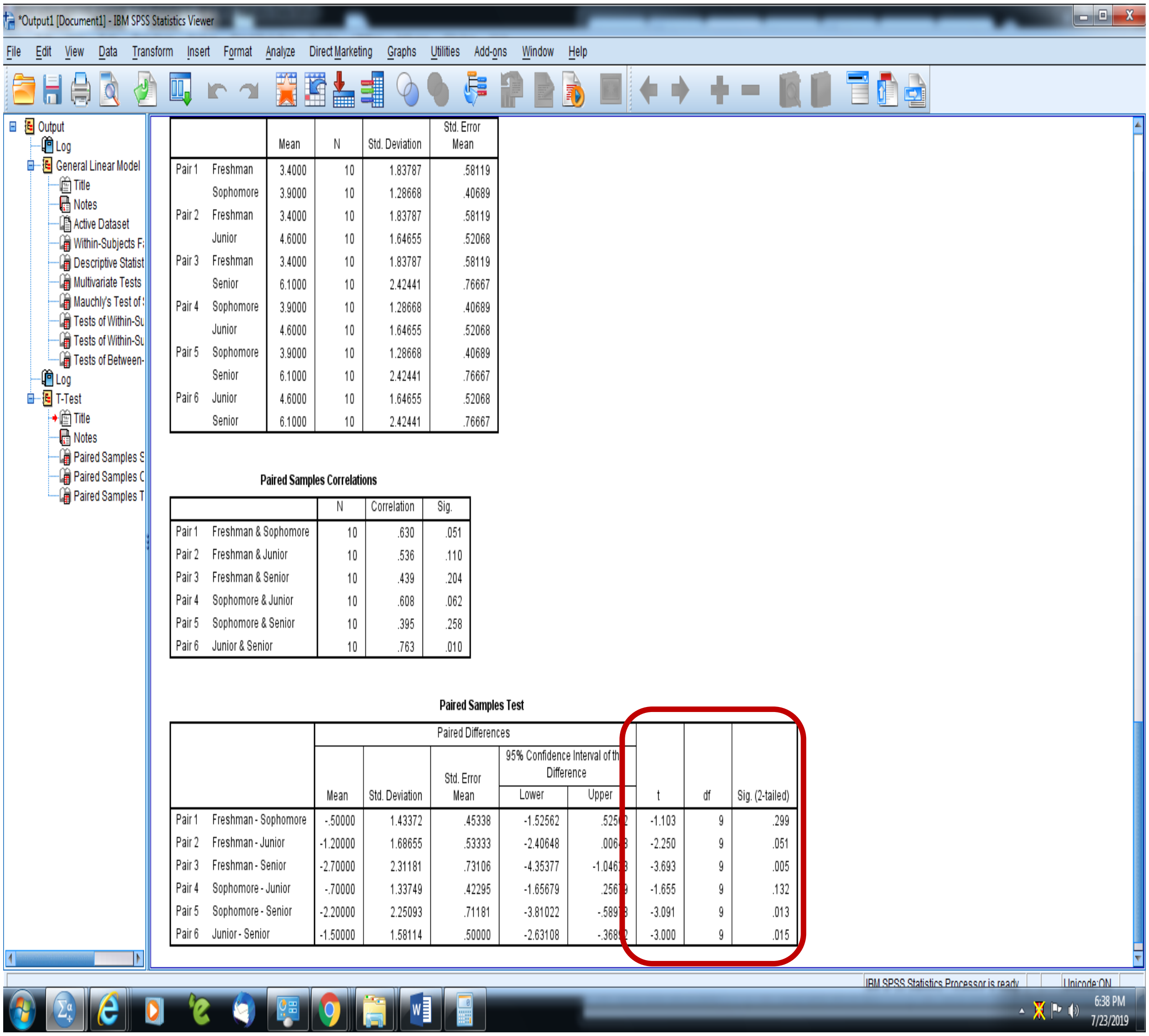
(by using paired sample t-test)

Path

Analyse – Compare means – paired sample t test







		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Freshman	3.4000	10	1.83787	.58119
	Sophomore	3.9000	10	1.28668	.40689
Pair 2	Freshman	3.4000	10	1.83787	.58119
	Junior	4.6000	10	1.64655	.52068
Pair 3	Freshman	3.4000	10	1.83787	.58119
	Senior	6.1000	10	2.42441	.76667
Pair 4	Sophomore	3.9000	10	1.28668	.40689
	Junior	4.6000	10	1.64655	.52068
Pair 5	Sophomore	3.9000	10	1.28668	.40689
	Senior	6.1000	10	2.42441	.76667
Pair 6	Junior	4.6000	10	1.64655	.52068
	Senior	6.1000	10	2.42441	.76667

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Freshman & Sophomore	10	.630	.051
Pair 2	Freshman & Junior	10	.536	.110
Pair 3	Freshman & Senior	10	.439	.204
Pair 4	Sophomore & Junior	10	.608	.062
Pair 5	Sophomore & Senior	10	.395	.258
Pair 6	Junior & Senior	10	.763	.010

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of th[e] Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Freshman - Sophomore	-.50000	1.43372	.45338	-1.52562	.525[illegible]2	-1.103	9	.299
Pair 2	Freshman - Junior	-1.20000	1.68655	.53333	-2.40648	.006[illegible]8	-2.250	9	.051
Pair 3	Freshman - Senior	-2.70000	2.31181	.73106	-4.35377	-1.046[illegible]3	-3.693	9	.005
Pair 4	Sophomore - Junior	-.70000	1.33749	.42295	-1.65679	.256[illegible]9	-1.655	9	.132
Pair 5	Sophomore - Senior	-2.20000	2.25093	.71181	-3.81022	-.589[illegible]8	-3.091	9	.013
Pair 6	Junior - Senior	-1.50000	1.58114	.50000	-2.63108	-.368[illegible]2	-3.000	9	.015

Alpha per test = total alpha / total number of post-hoc tests

Alpha per test = .05/6 = .008 (total alpha of .048)

<u>Decision rule for assessing if the test is significant (for α = .05)</u>

If p ≤ .008, the test is significant (attitudes towards e-texts were significantly different for the given pair in question)

If p > .008, the test is not significant (attitudes toward e-texts were not significantly different for the given pair in question)

Written results in APA format

As seniors, students were significantly more open to using e-texts in their courses than they were as freshman, t(9) = 3.69, p = .005. No other differences were significant at an alpha level of .008 per (post-hoc) test.

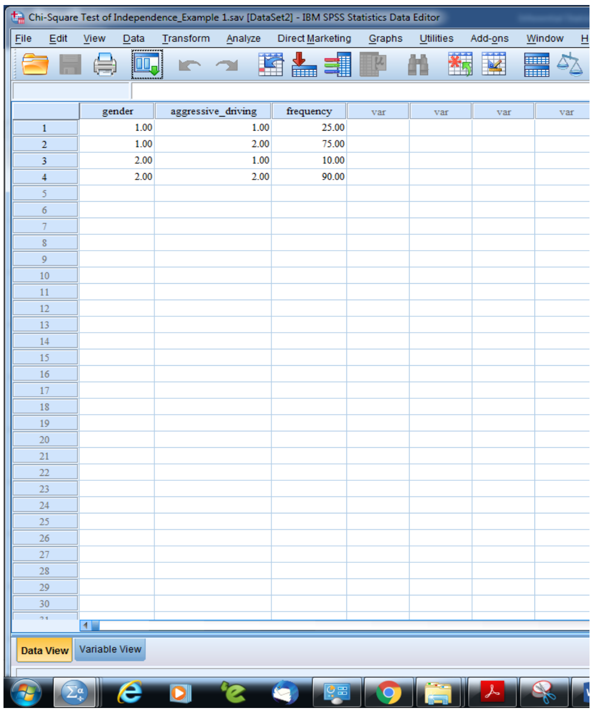
Test	**p-value**	**Significant**
Freshman vs Sophomore	.299	No
Freshman vs Junior	.051	No
Freshman vs Senior	.005	Yes (Senior more open than freshman)
Sophomore vs Junior	.132	No
Sophomore vs Senior	.013	No
Junior vs Senior	.015	No

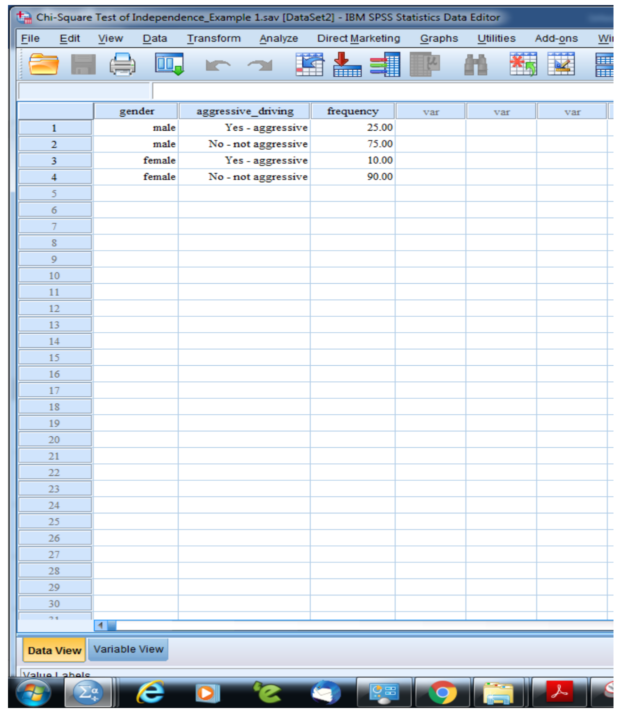
CHI-SQUARE TEST OF INDEPENDENCE

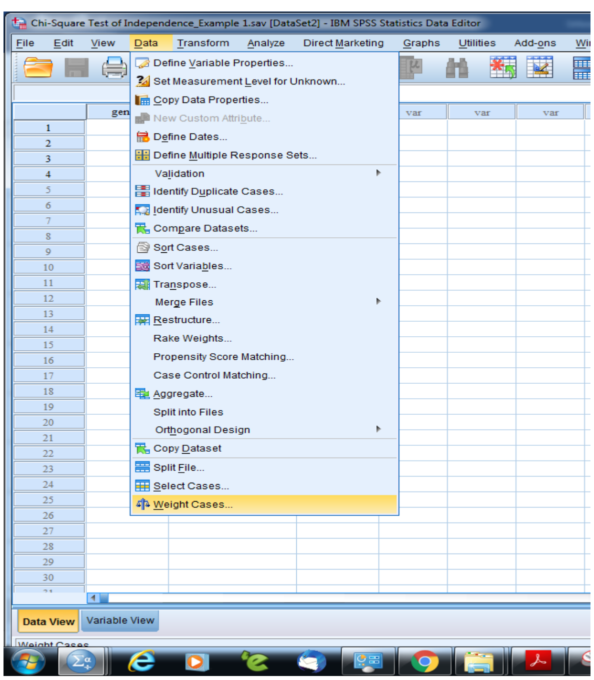
Chi squares test of intelligence - Measures whether there is a relationship between the two categorial variables

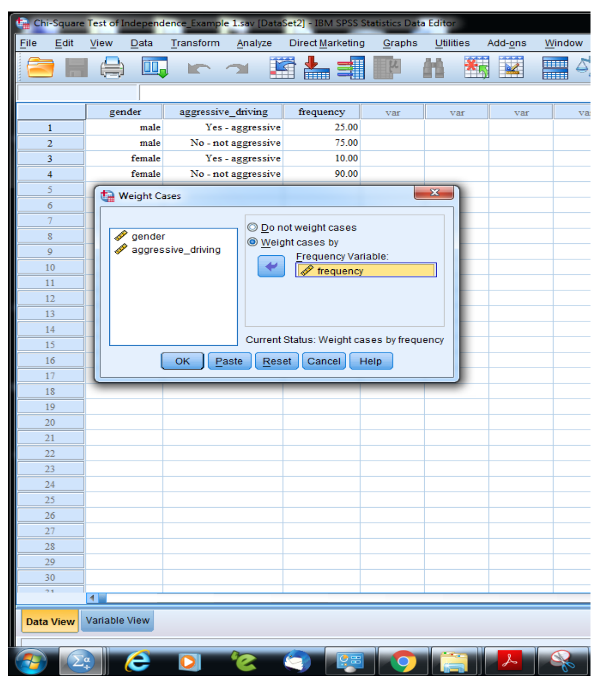
Path (Weight Cases)

Data – Weight Cases – (weight cases by)



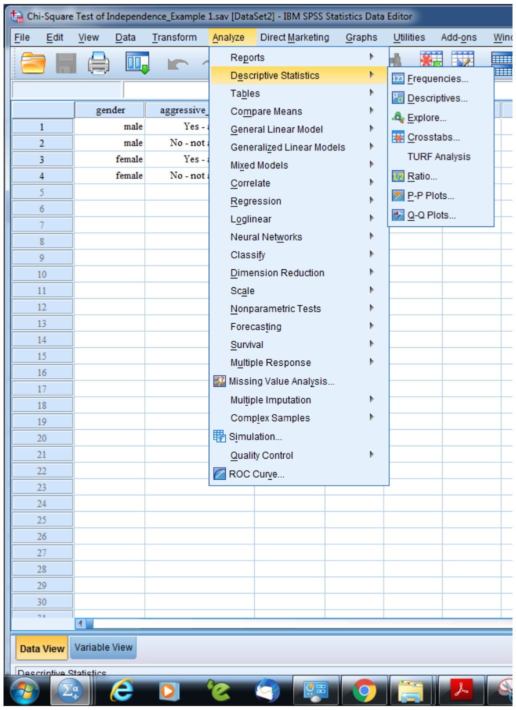


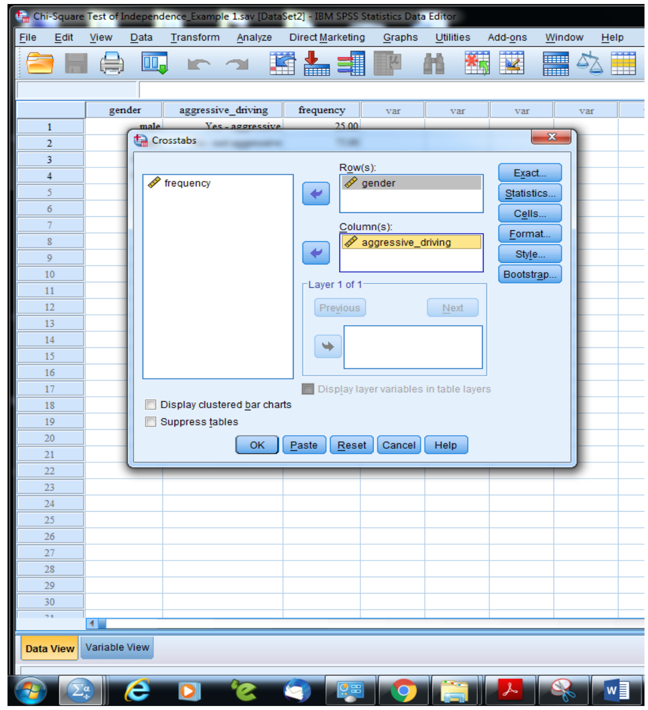


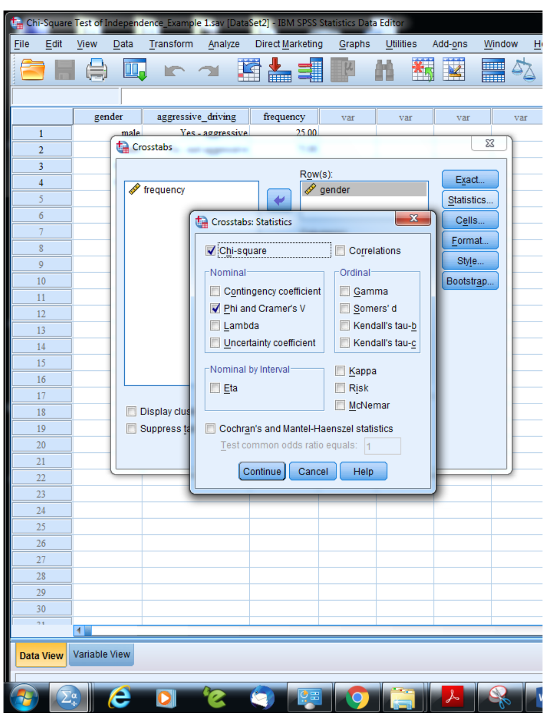


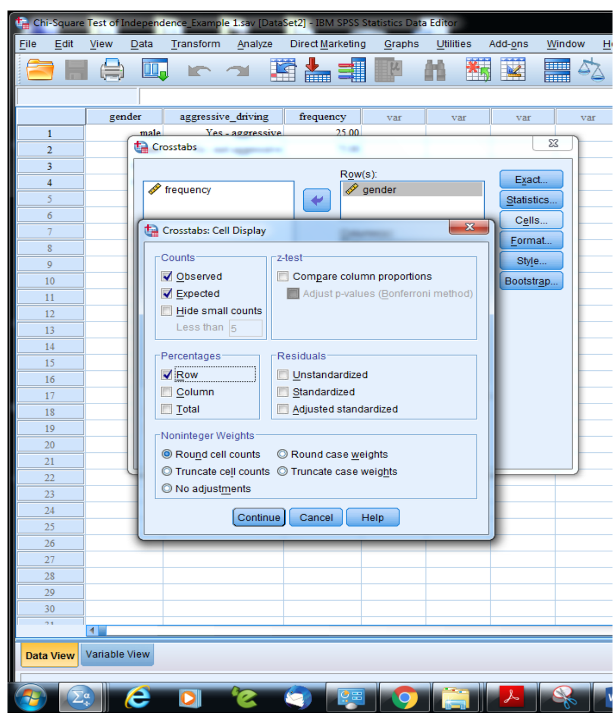
Path (Chi square test of Independence)

Analyse – Descriptive Statistics – Crosstabs









gender * aggressive_driving Crosstabulation

			aggressive_driving		
			Yes - aggressive	No - not aggressive	Total
gender	male	Count	25	75	100
		Expected Count	17.5	82.5	100.0
		% within gender	25.0%	75.0%	100.0%
	female	Count	10	90	100
		Expected Count	17.5	82.5	100.0
		% within gender	10.0%	90.0%	100.0%
Total		Count	35	165	200
		Expected Count	35.0	165.0	200.0
		% within gender	17.5%	82.5%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.792[a]	1	.005		
Continuity Correction[b]	6.788	1	.009		
Likelihood Ratio	8.007	1	.005		
Fisher's Exact Test				.009	.004
Linear-by-Linear Association	7.753	1	.005		
N of Valid Cases	200				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 17.50.

b. Computed only for a 2x2 table

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.197	.005
	Cramer's V	.197	.005
N of Valid Cases		200	

Phi and cramer's V is a effect size calculation in the chisquare test of independence.

Decision rule for assessing if the test is significant (for α = .05)

If $p \leq .05$, the test is significant (there is a significant relationship between two categorical variables {gender and aggressive driving behavior})

If $p > .05$, the test is not significant (there is a not significant relationship between two categorical variable)

Written results in APA format

There is a significant relationship between gender and aggressive driving behaviors, $\chi^2(1, N = 200) = 7.79$, $p = .005$. Men were more likely to engage in aggressive driving than were women (25% to 10%).

(Can report $p < .05$ instead of $p = .005$ if desired)

Effect Size

Cramer's V – applies to table where at least one variable had only two categories; for example, 2 x 2 tables, 2 x 3 tables etc.

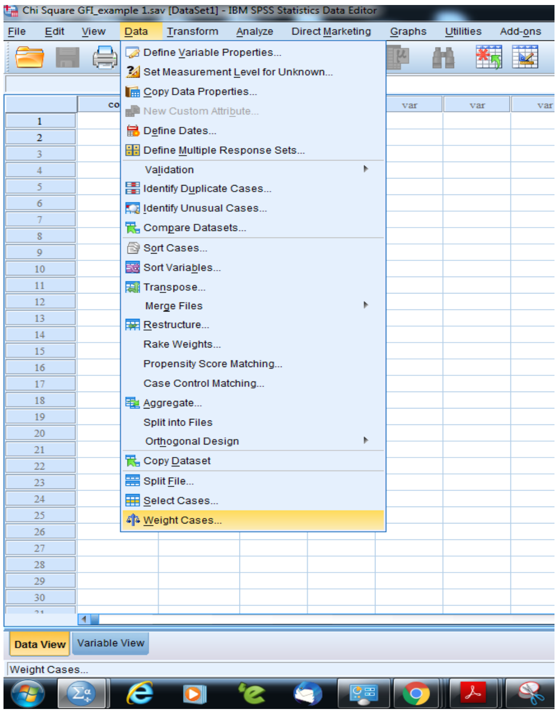
Small = .10,   Medium = .30,   Large = .50

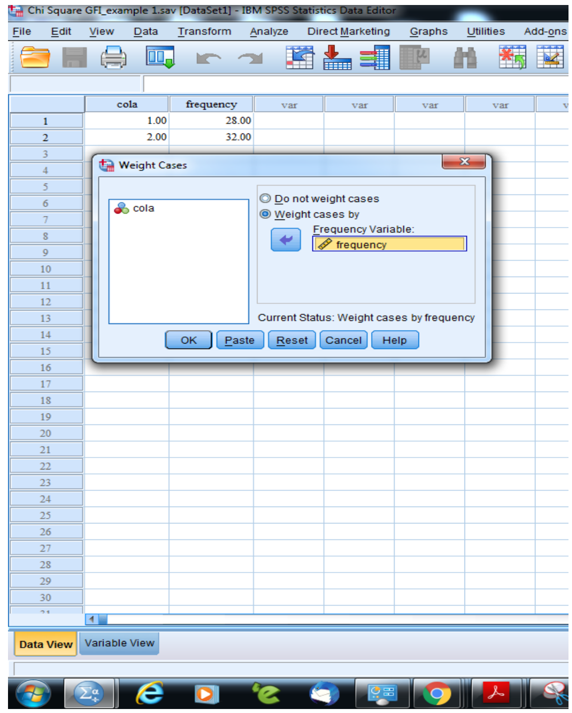
Cramer's V = .197 small effect size in this study.

CHI-SQUARE TEST OF GOODNESS OF FIT

Path (Weight Cases)

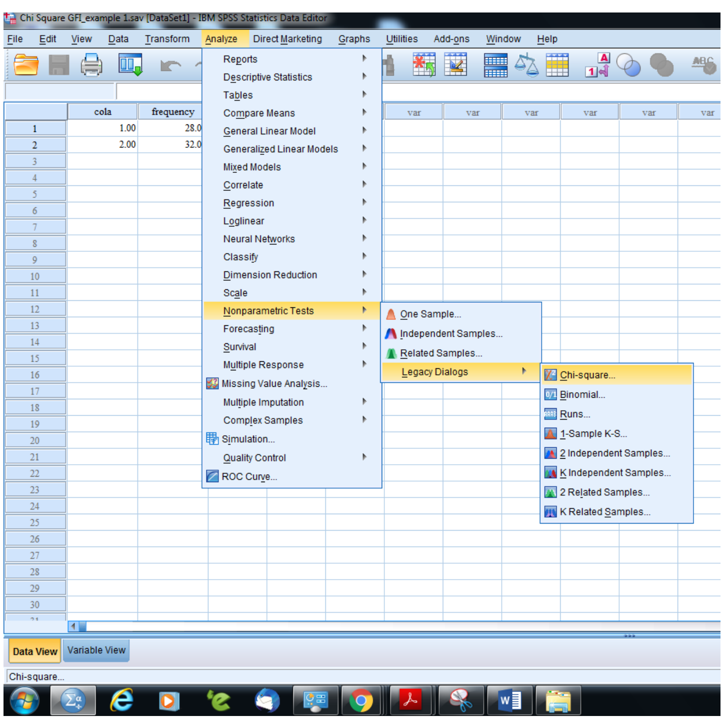
Data – Weight Cases – (weight cases by)

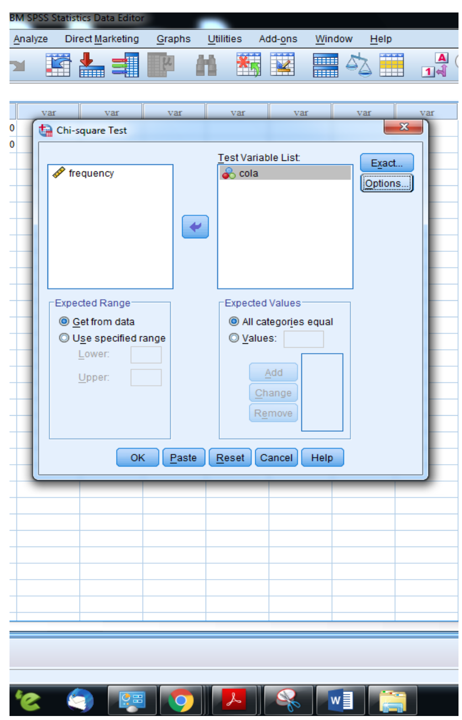




Path (Chi square test – Goodness of fit)

Analyse – Descriptive Statistics – Crosstabs





Test Statistics

Chi-Square Test

Frequencies

cola

	Observed N	Expected N	Residual
Cola A	28	30.0	-2.0
Cola B	32	30.0	2.0
Total	60		

Test Statistics

	cola
Chi-Square	.267[a]
df	1
Asymp. Sig.	.606

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 30.0.

Decision rule for assessing if the test is significant (for $\alpha = .05$)

If $p \leq .05$, the test is significant (there is a preference for one of the two types of colas)

If $p > .05$, the test is not significant (there is a not preference for one of the two types of colas)

Written results in APA format

There was not a significant preference for either type of cola, $\chi^2(1, N = 60) = 0.27$, $p = .606$.

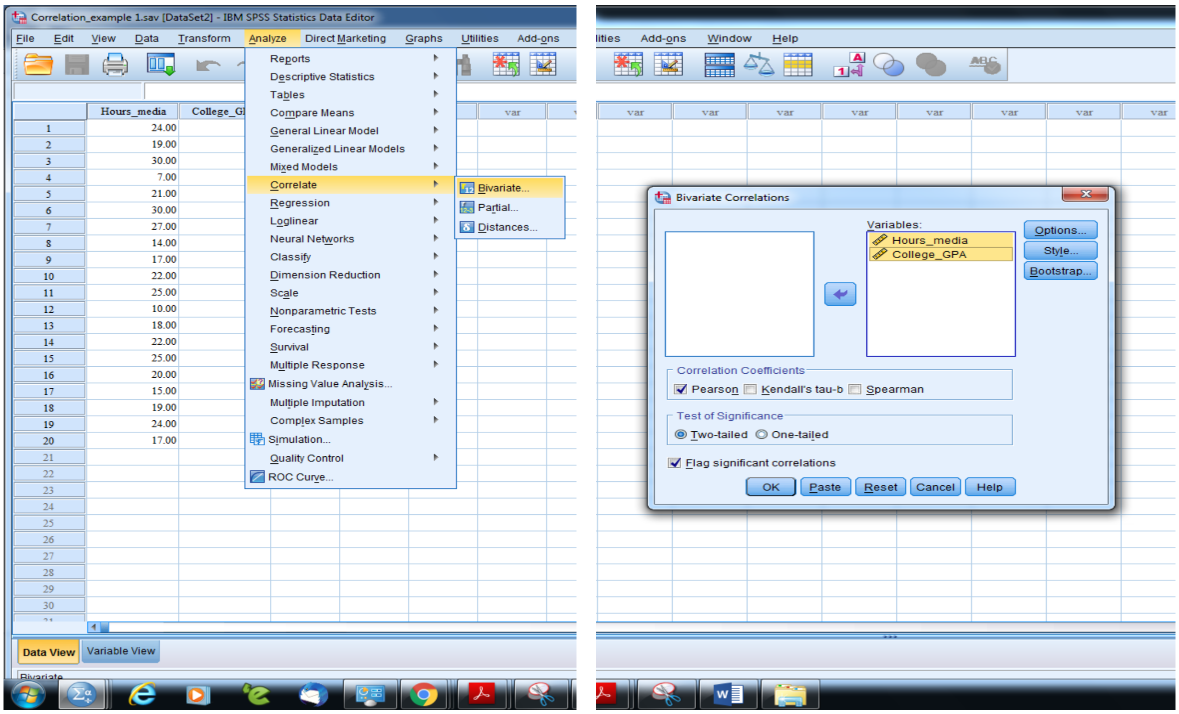
(Can report $p < .05$ instead of $p = .606$ if desired)

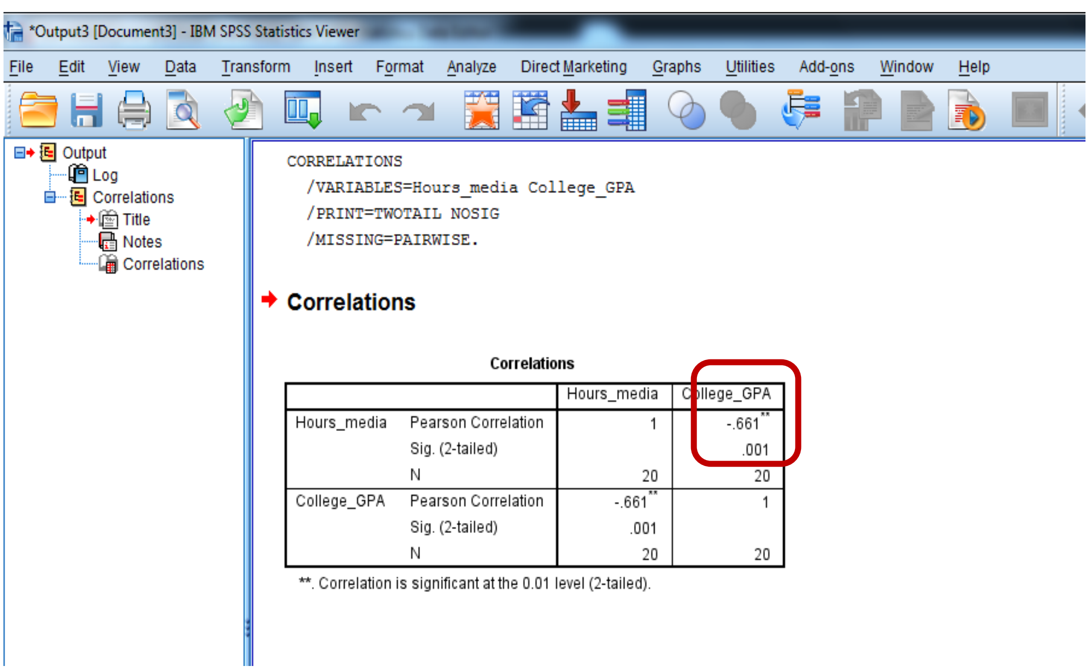
CORRELATION

Pearson Correlation: Measures the degree of the linear relationship between two variables. By linear relationship we meant that the relationship can be well-characterized by a straight line. Correlation ranged from -1.0 to +1.0. Pearson correlation is given by the letter r.

Path (Pearson Product Moment Correlation)

Analyse – Correlate - Bivariate





Correlations

		Hours_media	College_GPA
Hours_media	Pearson Correlation	1	-.661**
	Sig. (2-tailed)		.001
	N	20	20
College_GPA	Pearson Correlation	-.661**	1
	Sig. (2-tailed)	.001	
	N	20	20

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

<u>Decision rule for assessing if the test is significant (for α = .05)</u>

If $p \leq .05$, the test is significant (there is a significant relationship between the two variables)

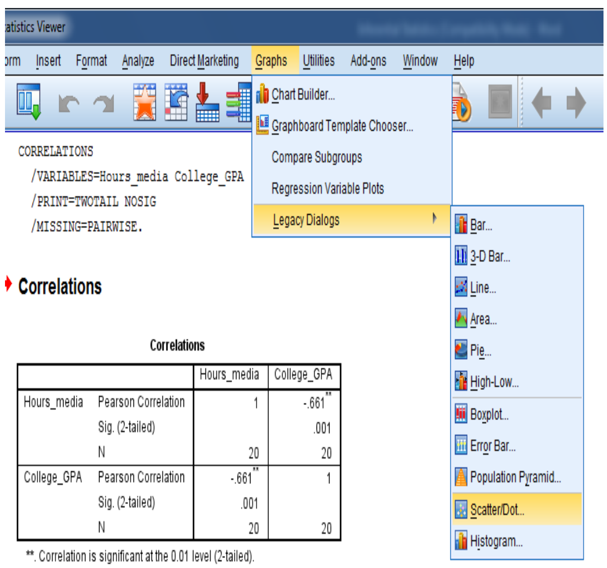
If $p > .05$, the test is not significant (there is a not significant relationship between the two variables)

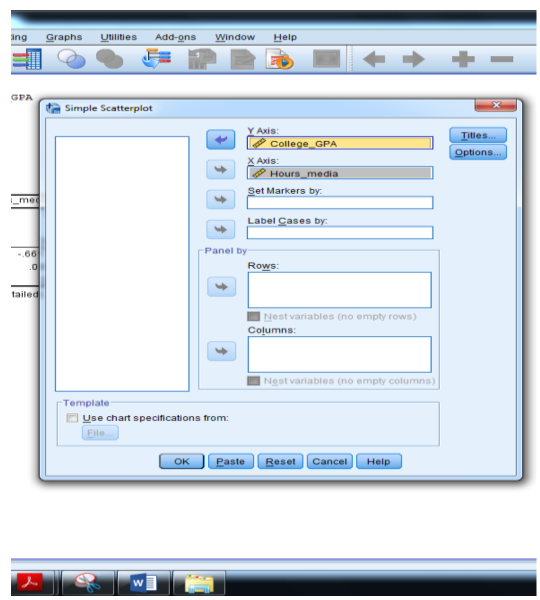
Written results in APA format

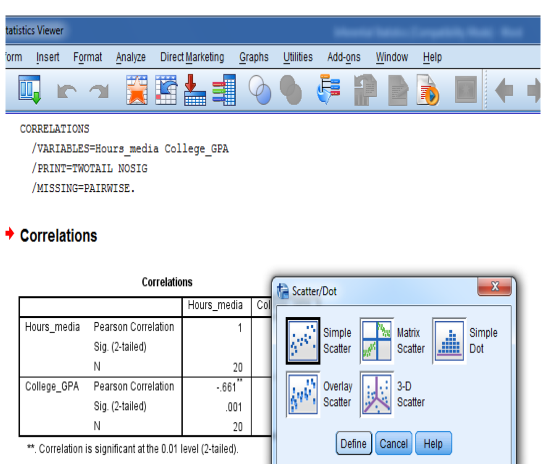
There is a significant negative relationship between hours of media watched and college GPA, $r(18) = -0.66$, $p = .001$

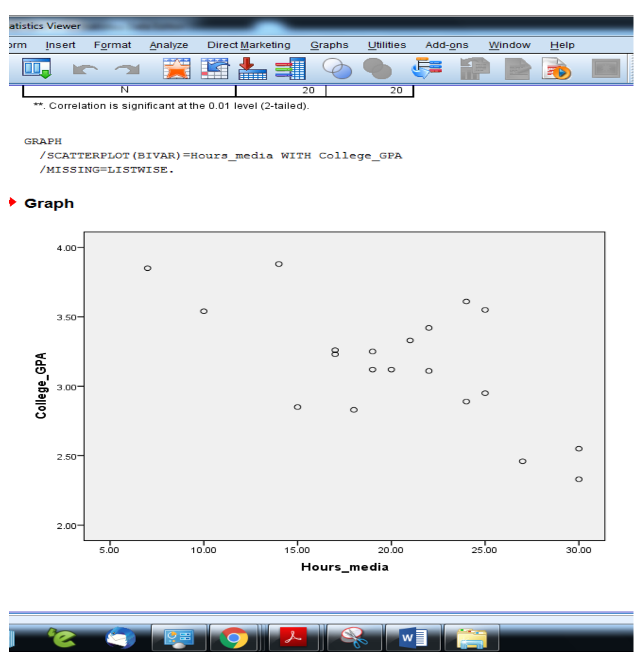
Path (Scatter Diagram)

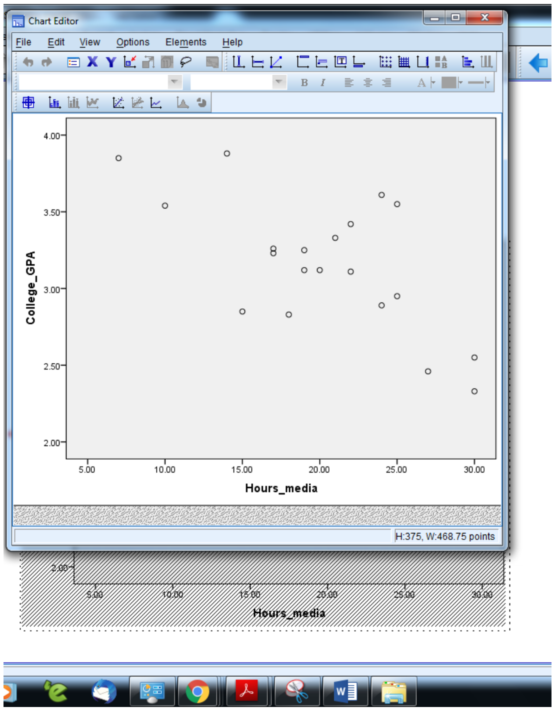
Graph – Legacy dialogue– Scatter / Dot







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File Edit View Options Elements Help
College_GPA
Hours_media
H:375, W:468.75 points

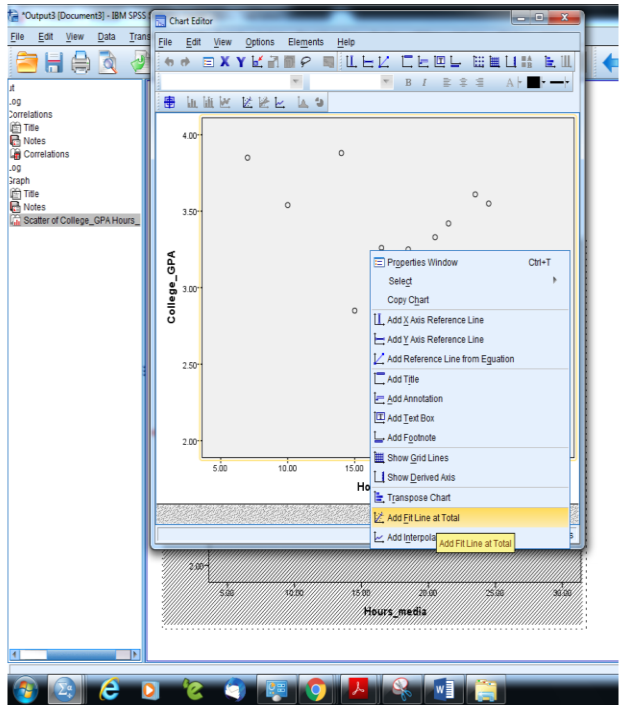
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Chart Editor
File Edit View Options Elements Help
Properties Window Ctrl+T
Select
Copy Chart
Add X Axis Reference Line
Add Y Axis Reference Line
Add Reference Line from Equation
Add Title
Add Annotation
Add Text Box
Add Footnote
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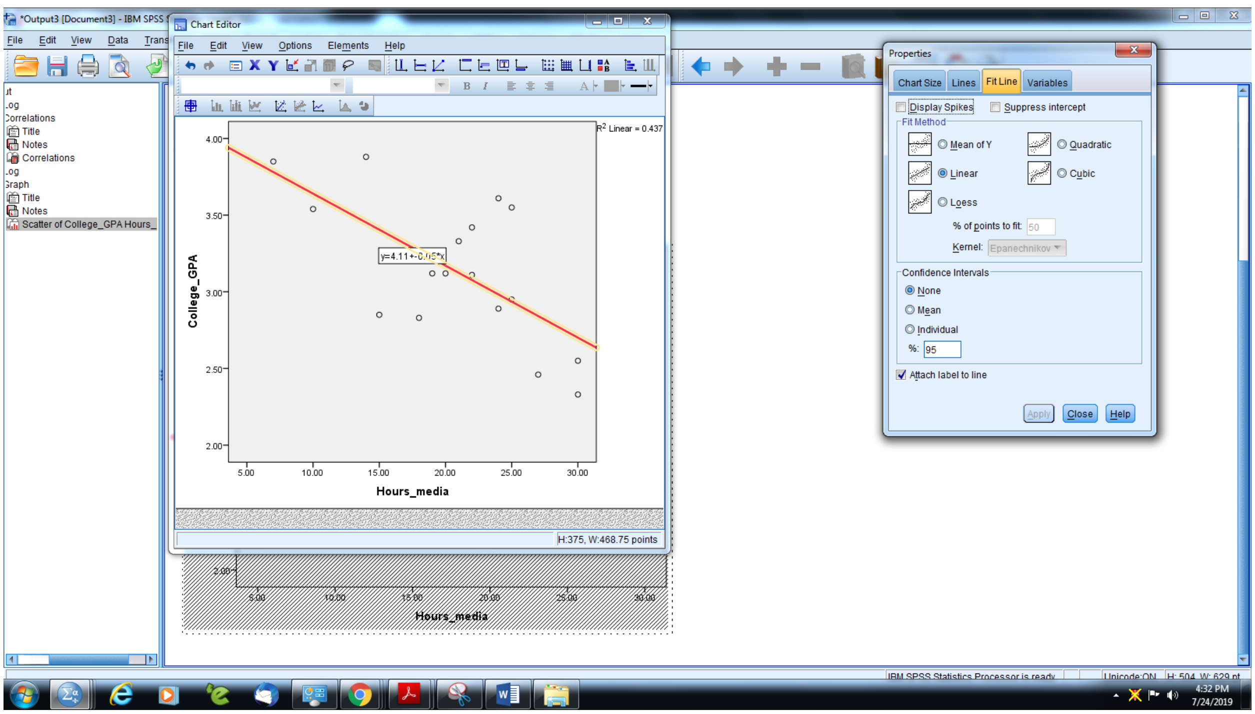
Show Derived Axis
Transpose Chart
Add Fit Line at Total
Add Interpola
Add Fit Line at Total
College_GPA
Hours_media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File Edit View Options Elements Help
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College_GPA
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H:375, W:468.75 points
Properties
Chart Size
Lines
Fit Line
Variables
Display Spikes
Suppress intercept
Fit Method
Mean of Y
Quadratic
Linear
Cubic
Loess
% of points to fit: 50
Kernel: Epanechnikov
Confidence Intervals
None
Mean
Individual
%: 95
Attach label to line
Apply
Close
Help
IBM SPSS Statistics Processor is ready
Unicode:ON
4:32 PM
7/24/2019

SIMPLE REGRESSION

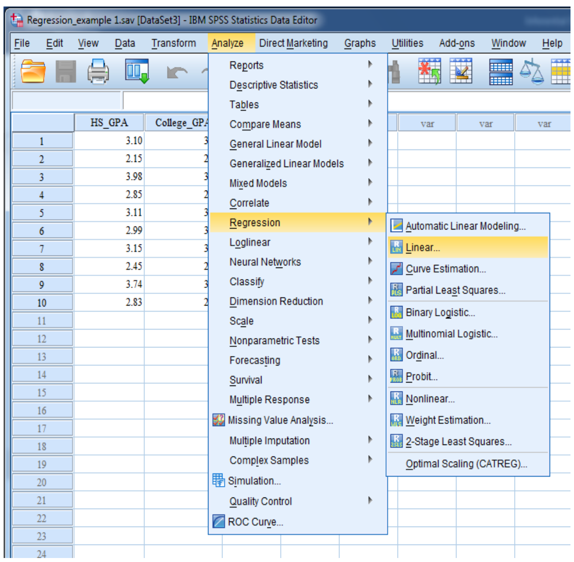
Simple Regression: Use scores on one variable X to predict scores on another variable Y.

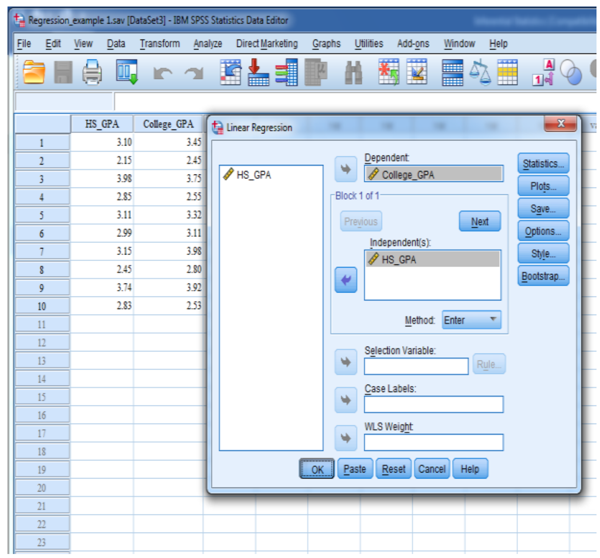
- X = Predictor or Independent Variable (IV)
- Y = Criterion or Dependent Variable (DV)

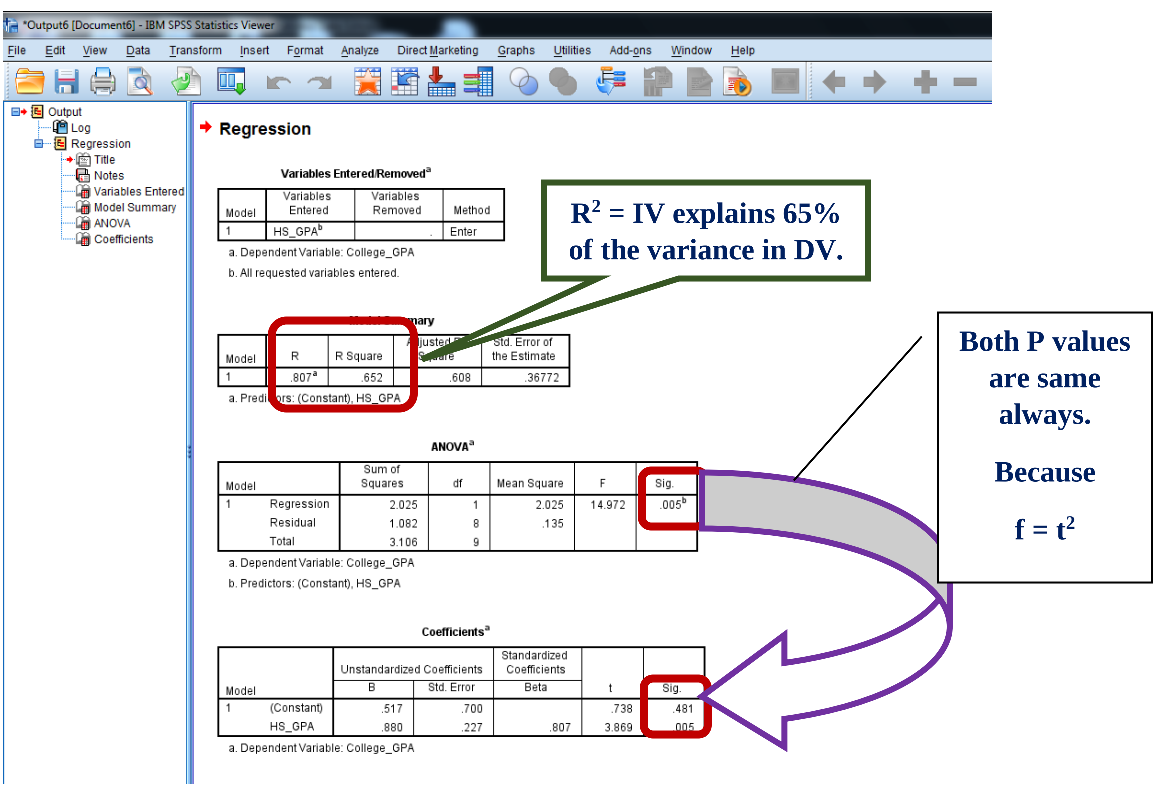
(Simple regression uses one X; multiple regression uses two or more Xs)

Path

Analyse – Regression – Linear







Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	HS_GPA[b]	.	Enter

a. Dependent Variable: College_GPA

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.807[a]	.652	.608	.36772

a. Predictors: (Constant), HS_GPA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.025	1	2.025	14.972	.005[b]
	Residual	1.082	8	.135		
	Total	3.106	9			

a. Dependent Variable: College_GPA

b. Predictors: (Constant), HS_GPA

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.517	.700		.738	.481
	HS_GPA	.880	.227	.807	3.869	.005

a. Dependent Variable: College_GPA

Model Summary Table – Output

R = Multiple Correlation Coefficient; in simple regression is it equal to the Pearson correlation

R(Square) = R^2 = the amount of variance in the DV (Criterion) that is accounted for or explained by the IV (Predictor)

ANOVA Table or coefficient table

Decision rule for assessing if the test is significant (for $\alpha = .05$)

If $p \leq .05$, the test is significant (IV is a significant predictor of DV)

If $p > .05$, the test is not significant (IV is not a significant predictor of DV)

Written results in APA format

Using ANOVA Table:

High school GPA was a significant predictor of college GPA, $F(1,8) = 14.97$, $p = .005$, $R^2 = .65$

Using Coefficient Table:

High school GPA was a significant predictor of college GPA, $\beta = .81$, $t\ (8) = 3.87$, $p = .005$, $R^2 = .65$

$F = t^2$ in simple regression

$14.972 = 3.869^2$

Regression Equation:

$$\hat{Y}_{College\_GPA} = .517 + .880(HS - GPA)$$