

**Host**

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## Tukey Kramer Test / Tukey-Kramer Post Hoc Analysis

Tukey Kramer Test / Tukey-Kramer Post Hoc Analysis  
Step 1: Import dataset.csv from the Tukey Kramer Test folder

## Dataset Name

### Warnings

The active dataset will replace the existing dataset named  
TukeyKramerData.

---

## Tukey Kramer Test - Variable Labels

```
>Warning # 2004.  Command name: SUBTITLE  
>The subtitle given exceeds 60 characters in length.  The first 60 characters  
>will be used.
```

Tukey Kramer Test - Variable Labels  
Dependent variable is G3 and grouping factor is studytime by

Tukey Kramer Test - Saved Working Data

Tukey Kramer Test - Saved Working Data  
The imported dataset is saved as SAV before analysis

## Tukey Kramer Test - Data Screening

Tukey Kramer Test - Data Screening  
 Frequency of studytime groups before one-way ANOVA

## Frequencies

### Statistics

Weekly study time group / Tukey-Kramer post hoc factor

N	Valid	649
	Missing	0

### Weekly study time group / Tukey-Kramer post hoc factor

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	212	32.7	32.7	32.7
	2	305	47.0	47.0	79.7
	3	97	14.9	14.9	94.6
	4	35	5.4	5.4	100.0
	Total	649	100.0	100.0	

## Tukey Kramer Test - Dependent Variable Screening

Tukey Kramer Test - Dependent Variable Screening  
Overall descriptive statistics for G3

## Descriptives

### Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Final grade / dependent variable	649	.00	19.00	11.9060	3.23066
Valid N (listwise)	649				

## Tukey Kramer Test - Group Descriptives

```
>Warning # 2004.  Command name: SUBTITLE  
>The subtitle given exceeds 60 characters in length.  The first 60 characters  
>will be used.
```

Tukey Kramer Test - Group Descriptives  
 Counts, means, standard deviations, variance, standard error

**Means**

**Case Processing Summary**

	Included		Cases Excluded		Total	
	N	Percent	N	Percent	N	Percent
	Final grade / dependent variable * Weekly study time group / Tukey-Kramer post hoc factor	649	100.0%	0	0.0%	649

**Report**

Final grade / dependent variable

Weekly study time group / Tukey-Kramer post hoc factor	N	Mean	Std. Deviation	Variance	Std. Error of Mean
1	212	10.8443	3.21862	10.360	.22106
2	305	12.0918	3.24313	10.518	.18570
3	97	13.2268	2.50210	6.261	.25405
4	35	13.0571	3.03841	9.232	.51358
Total	649	11.9060	3.23066	10.437	.12681

**Report**

Final grade / dependent variable

Weekly study time group / Tukey-Kramer post hoc factor	Minimum	Maximum
1	.00	18.00
2	.00	19.00
3	8.00	18.00
4	6.00	19.00
Total	.00	19.00

## Tukey Kramer Test - Distribution Context

>Warning # 2004. Command name: SUBTITLE

>The subtitle given exceeds 60 characters in length. The first 60 characters  
>will be used.

Tukey Kramer Test - Distribution Context  
 Boxplots, histograms, normal probability plots, and descript

**Explore**

**Weekly study time group / Tukey-Kramer post hoc factor**

**Case Processing Summary**

	Weekly study time group / Tukey-Kramer post hoc factor	Cases			
		Valid		Missing	
		N	Percent	N	Percent
Final grade / dependent variable	1	212	100.0%	0	0.0%
	2	305	100.0%	0	0.0%
	3	97	100.0%	0	0.0%
	4	35	100.0%	0	0.0%

**Case Processing Summary**

	Weekly study time group / Tukey-Kramer post hoc factor	Cases	
		Total	
		N	Percent
Final grade / dependent variable	1	212	100.0%
	2	305	100.0%
	3	97	100.0%
	4	35	100.0%

Tukey Kramer Test - Distribution Context  
 Boxplots, histograms, normal probability plots, and descript

**Descriptives**

	Weekly study time group / Tukey-Kramer post hoc factor	Statistic			
Final grade / dependent variable	1	Mean	10.8443		
		95% Confidence Interval for Mean	Lower Bound	10.4086	
			Upper Bound	11.2801	
		5% Trimmed Mean	11.0419		
		Median	11.0000		
		Variance	10.360		
		Std. Deviation	3.21862		
		Minimum	.00		
		Maximum	18.00		
		Range	18.00		
		Interquartile Range	3.00		
		Skewness	-1.078		
		Kurtosis	3.117		
			2	Mean	12.0918
				95% Confidence Interval for Mean	Lower Bound
Upper Bound	12.4572				
5% Trimmed Mean	12.2505				
Median	12.0000				
Variance	10.518				
Std. Deviation	3.24313				
Minimum	.00				
Maximum	19.00				
Range	19.00				
Interquartile Range	4.00				
Skewness	-1.028				
Kurtosis	3.044				
	3			Mean	13.2268
				95% Confidence Interval for Mean	Lower Bound
		Upper Bound	13.7311		
		5% Trimmed Mean	13.2732		
		Median	13.0000		
		Variance	6.261		

Tukey Kramer Test - Distribution Context  
 Boxplots, histograms, normal probability plots, and descript

**Descriptives**

	Weekly study time group / Tukey-Kramer post hoc factor		Std. Error		
Final grade / dependent variable	1	Mean	.22106		
		95% Confidence Interval for Mean	Lower Bound		
			Upper Bound		
		5% Trimmed Mean			
		Median			
		Variance			
		Std. Deviation			
		Minimum			
		Maximum			
		Range			
		Interquartile Range			
		Skewness	.167		
		Kurtosis	.333		
		2	2	Mean	.18570
				95% Confidence Interval for Mean	Lower Bound
Upper Bound					
5% Trimmed Mean					
Median					
Variance					
Std. Deviation					
Minimum					
Maximum					
Range					
Interquartile Range					
Skewness	.140				
Kurtosis	.278				
3	3			Mean	.25405
				95% Confidence Interval for Mean	Lower Bound
		Upper Bound			
		5% Trimmed Mean			
		Median			
		Variance			

Tukey Kramer Test - Distribution Context  
 Boxplots, histograms, normal probability plots, and descript

**Descriptives**

Weekly study time group / Tukey-Kramer post hoc factor	Statistic
	Std. Deviation
	2.50210
	Minimum
	8.00
	Maximum
	18.00
	Range
	10.00
	Interquartile Range
	3.50
	Skewness
	-.190
	Kurtosis
	-.502
4	Mean
	13.0571
	95% Confidence Interval for Mean
	Lower Bound
	12.0134
	Upper Bound
	14.1009
	5% Trimmed Mean
	13.0714
	Median
	13.0000
	Variance
	9.232
	Std. Deviation
	3.03841
	Minimum
	6.00
	Maximum
	19.00
	Range
	13.00
	Interquartile Range
	4.00
	Skewness
	.209
	Kurtosis
	-.339

Tukey Kramer Test - Distribution Context  
 Boxplots, histograms, normal probability plots, and descript

**Descriptives**

Weekly study time group / Tukey-Kramer post hoc factor		Std. Error
	Std. Deviation	
	Minimum	
	Maximum	
	Range	
	Interquartile Range	
	Skewness	.245
	Kurtosis	.485
4	Mean	.51358
	95% Confidence Interval for Mean	Lower Bound Upper Bound
	5% Trimmed Mean	
	Median	
	Variance	
	Std. Deviation	
	Minimum	
	Maximum	
	Range	
	Interquartile Range	
	Skewness	.398
	Kurtosis	.778

**Tests of Normality**

	Weekly study time group / Tukey-Kramer post hoc factor	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-...
		Statistic	df	Sig.	Statistic
Final grade / dependent variable	1	.161	212	.000	.898
	2	.125	305	.000	.917
	3	.103	97	.013	.970
	4	.136	35	.099	.955

Tukey Kramer Test - Distribution Context  
 Boxplots, histograms, normal probability plots, and descript

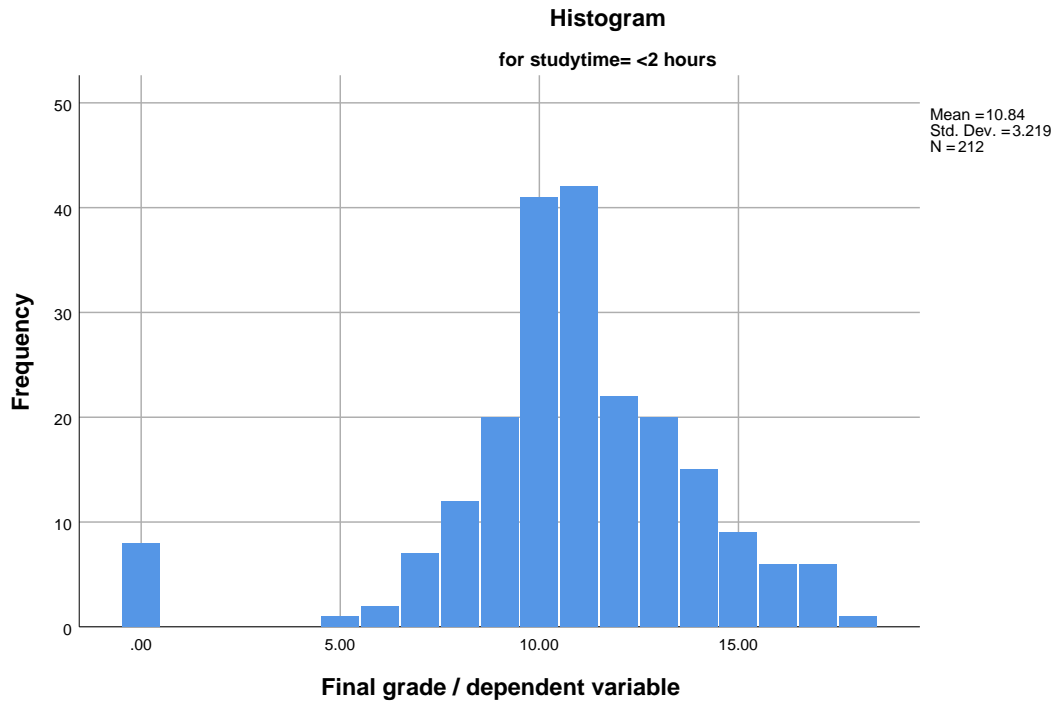
**Tests of Normality**

Final grade / dependent variable	Weekly study time group / Tukey-Kramer post hoc factor	Shapiro-Wilk	
		df	Sig.
	1	212	.000
	2	305	.000
	3	97	.025
	4	35	.166

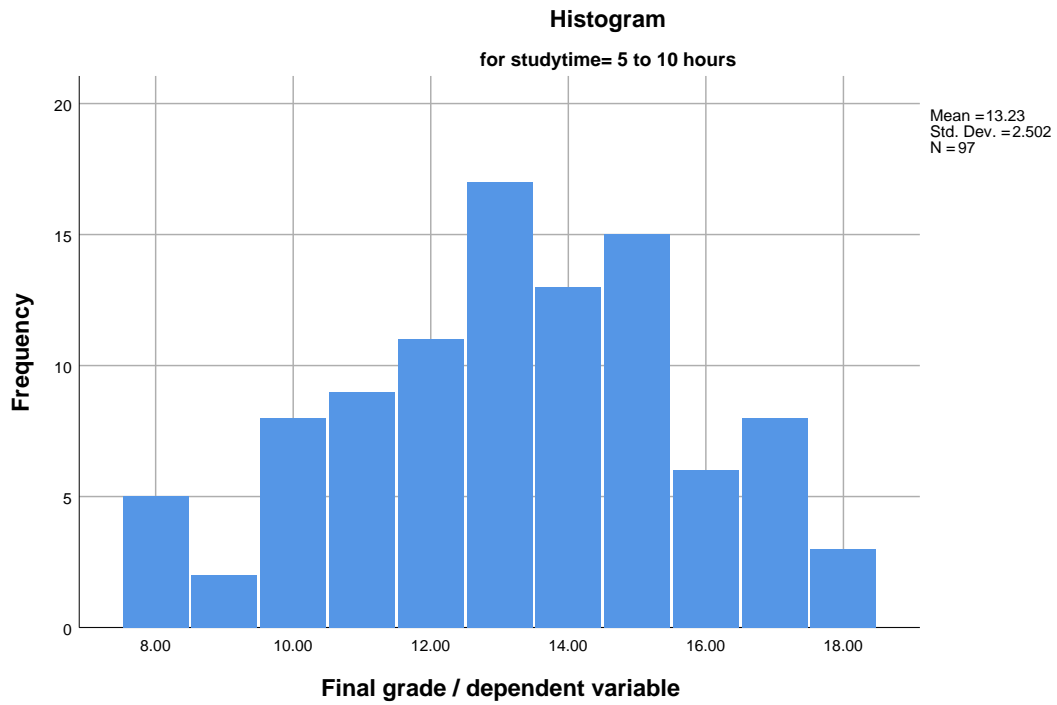
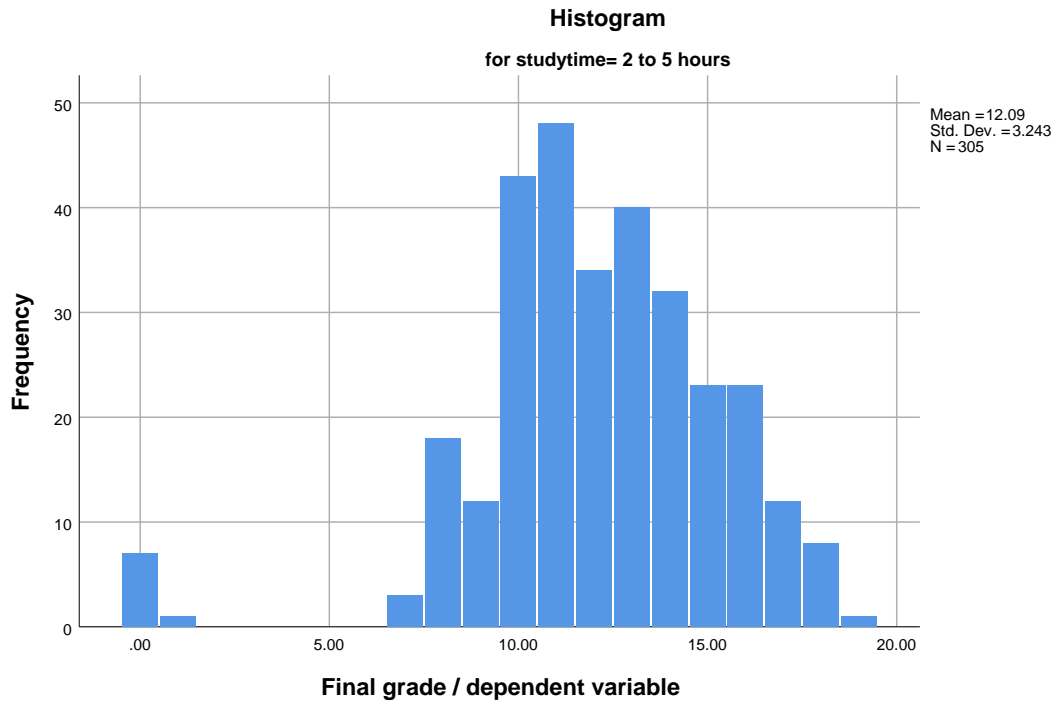
a. Lilliefors Significance Correction

**Final grade / dependent variable**

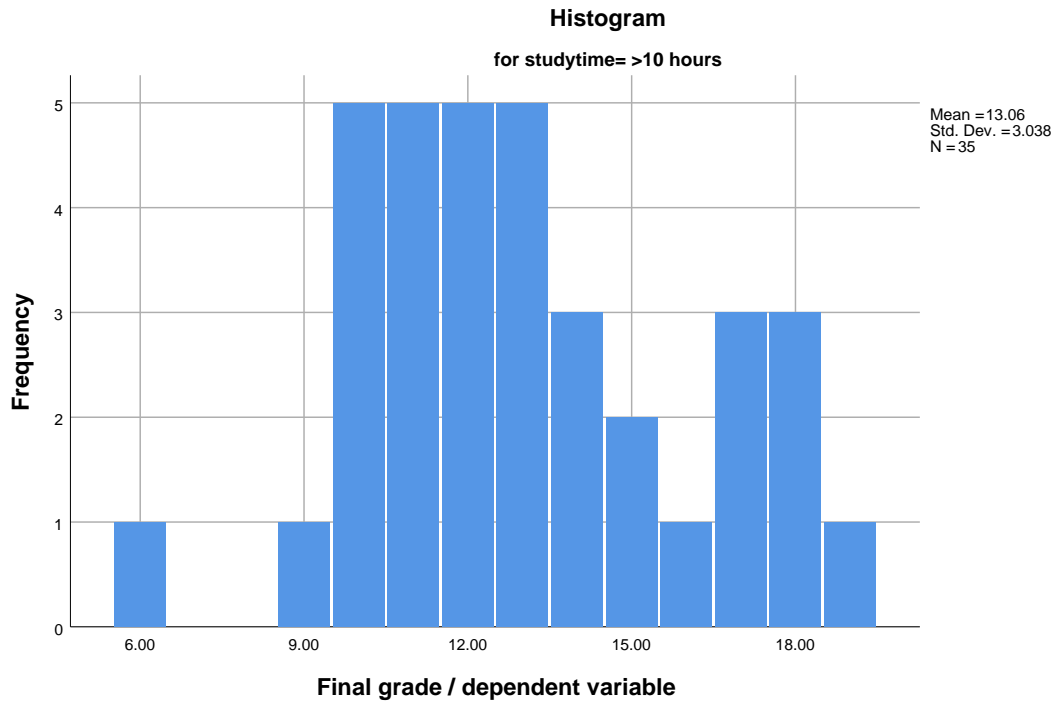
**Histograms**



Tukey Kramer Test - Distribution Context  
Boxplots, histograms, normal probability plots, and descript

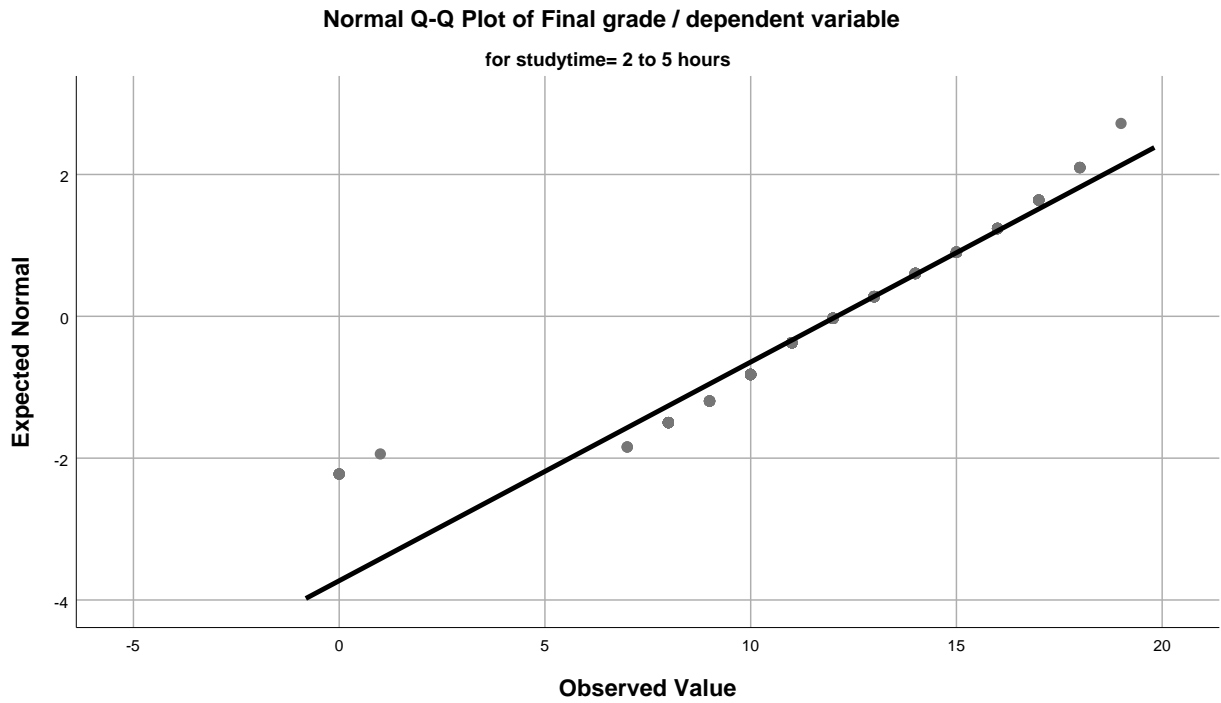
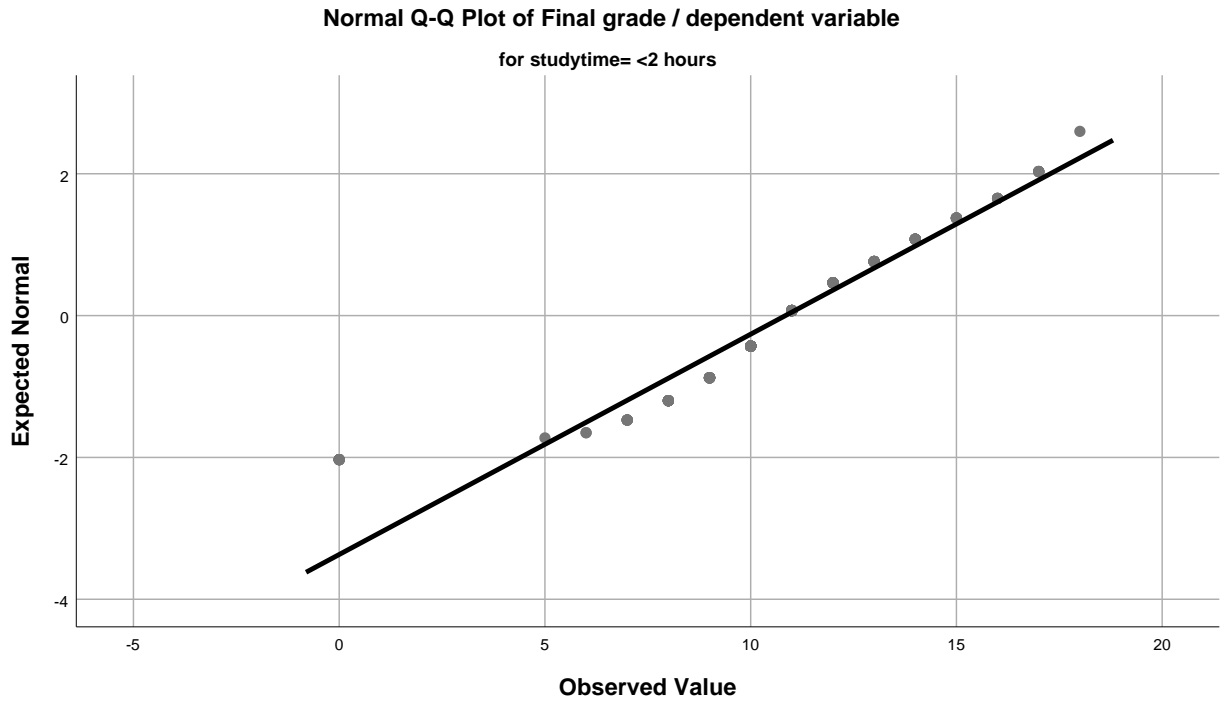


Tukey Kramer Test - Distribution Context  
Boxplots, histograms, normal probability plots, and descript

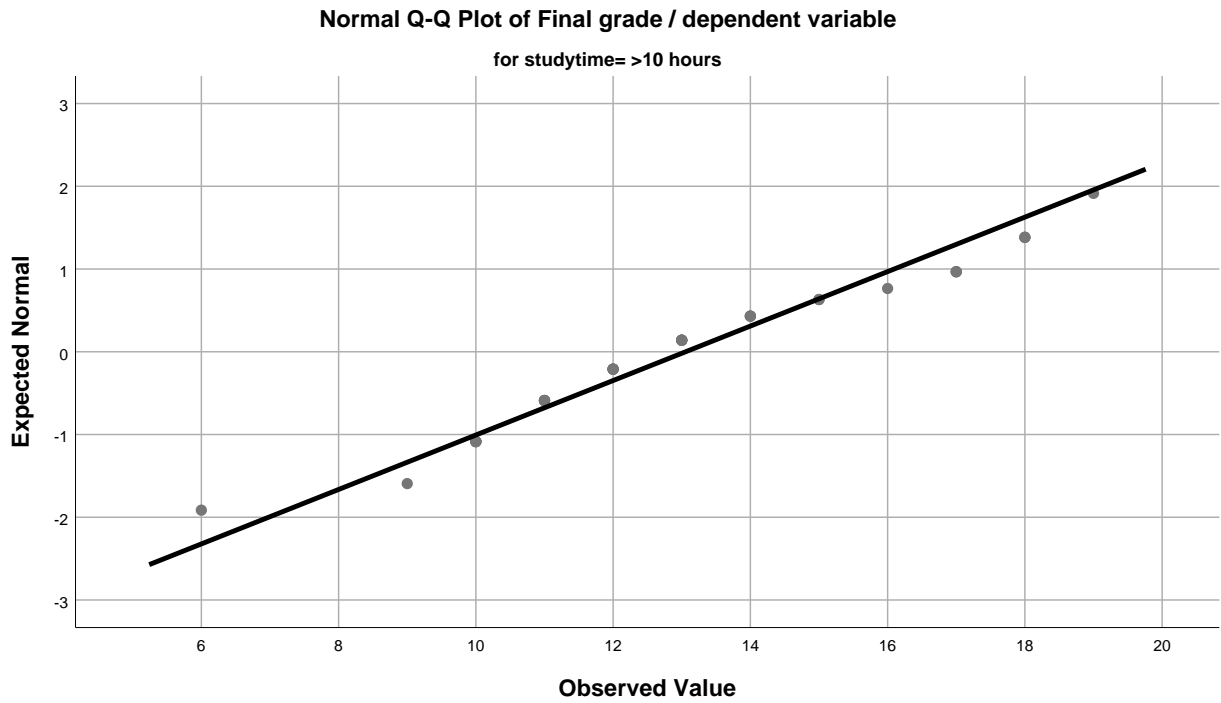
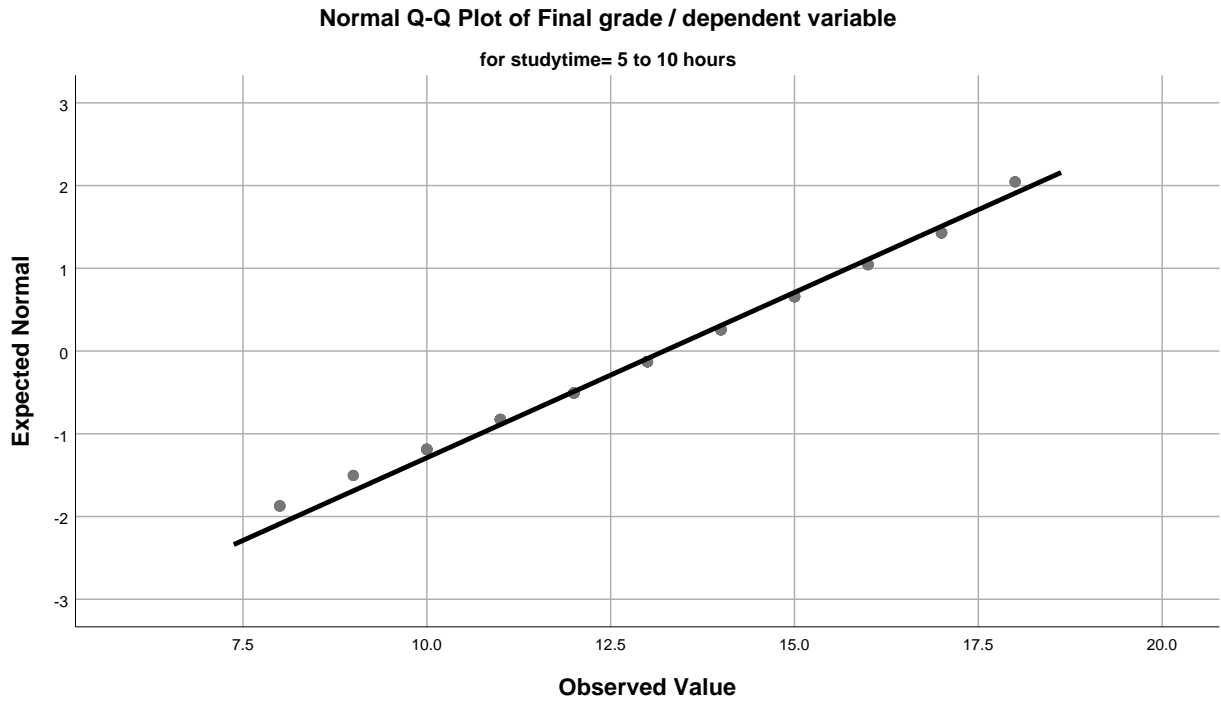


**Normal Q-Q Plots**

Tukey Kramer Test - Distribution Context  
Boxplots, histograms, normal probability plots, and descript

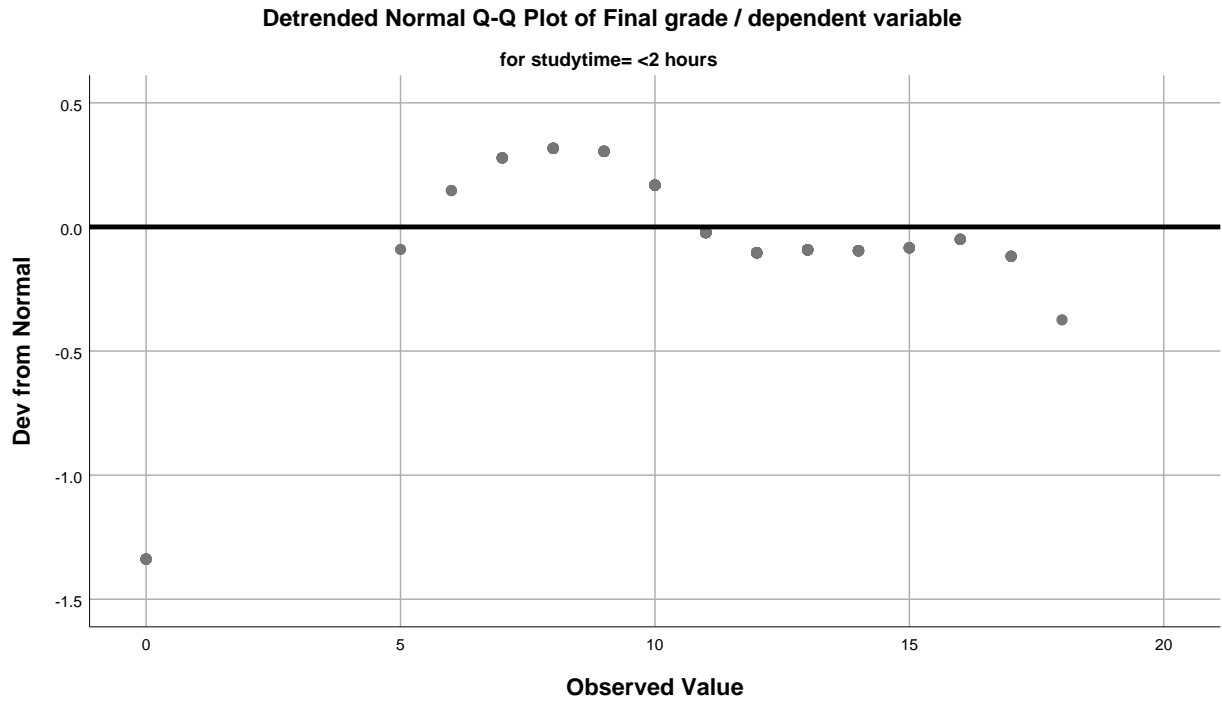


Tukey Kramer Test - Distribution Context  
Boxplots, histograms, normal probability plots, and descript

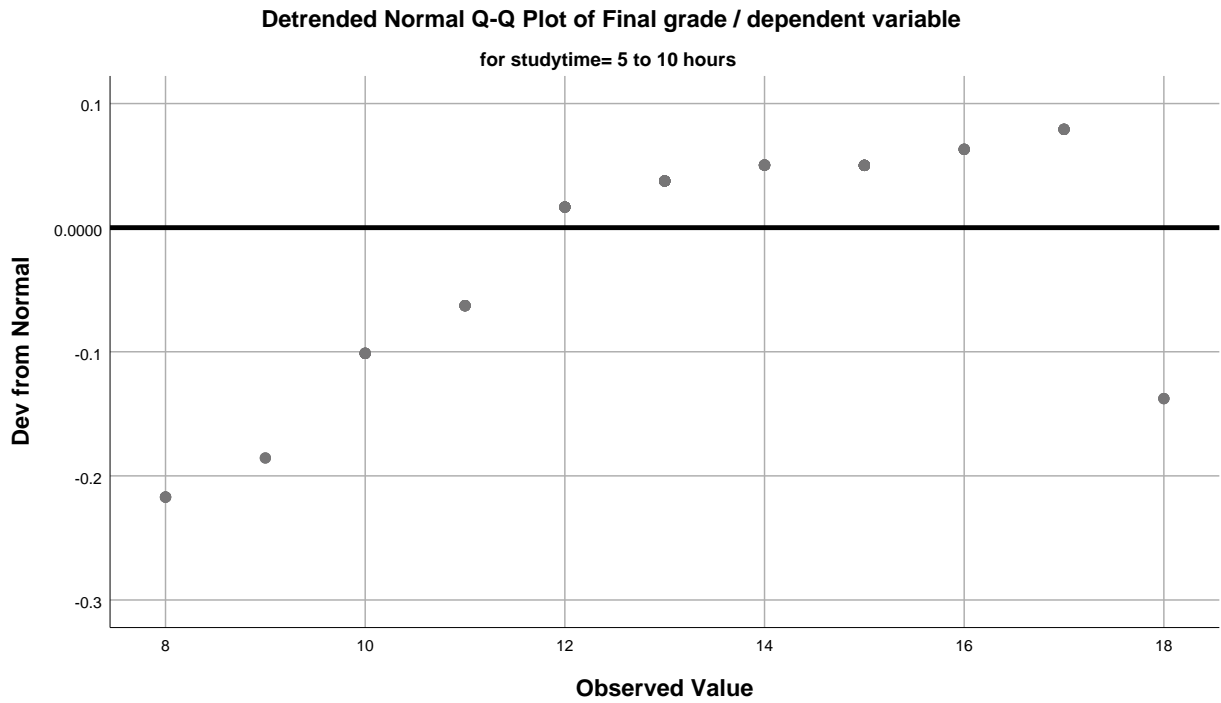
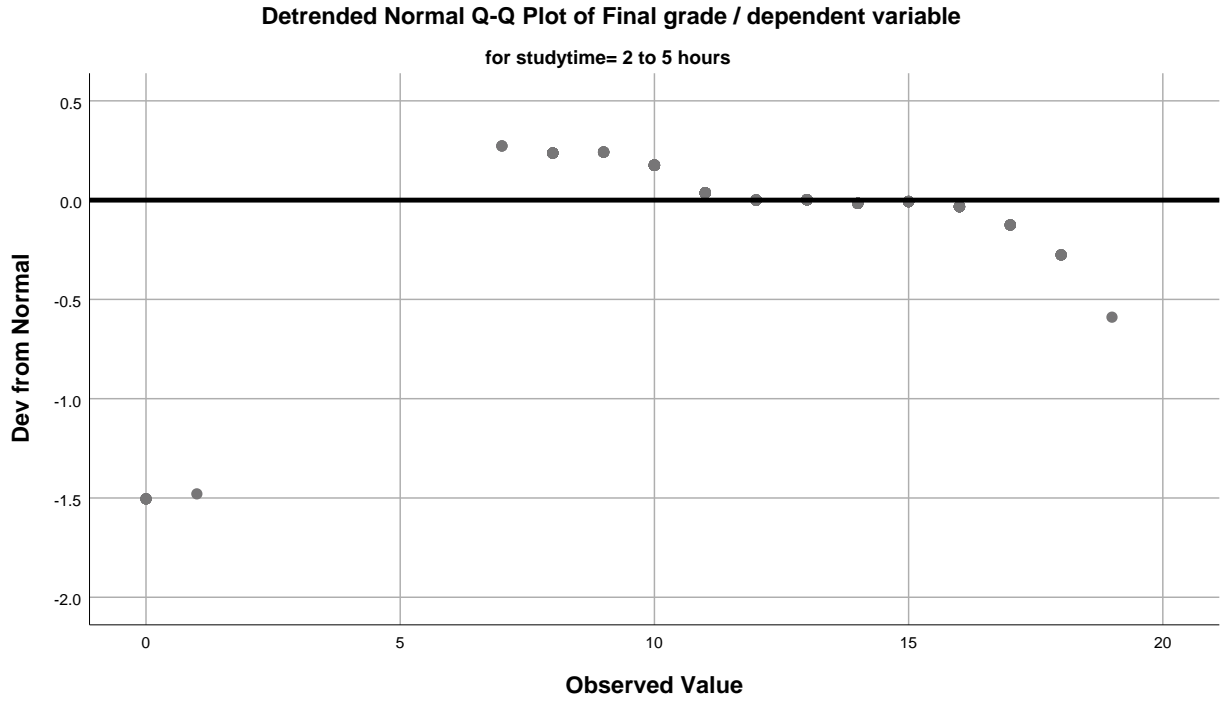


Tukey Kramer Test - Distribution Context  
Boxplots, histograms, normal probability plots, and descript

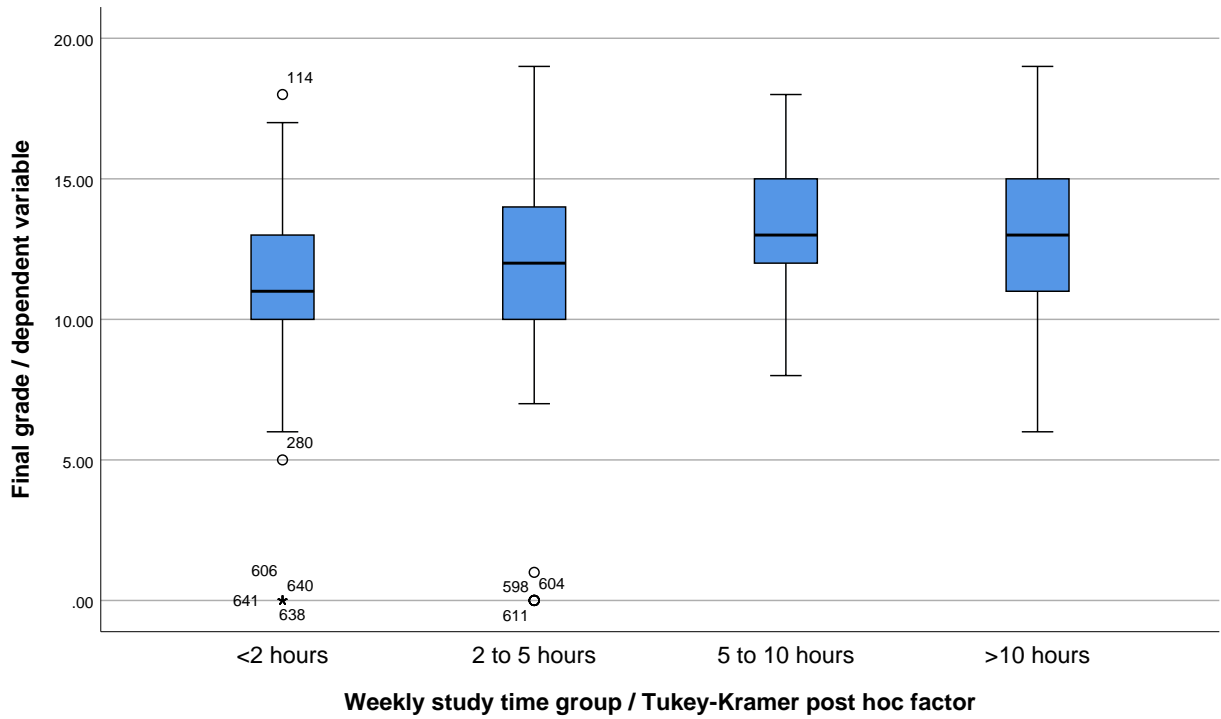
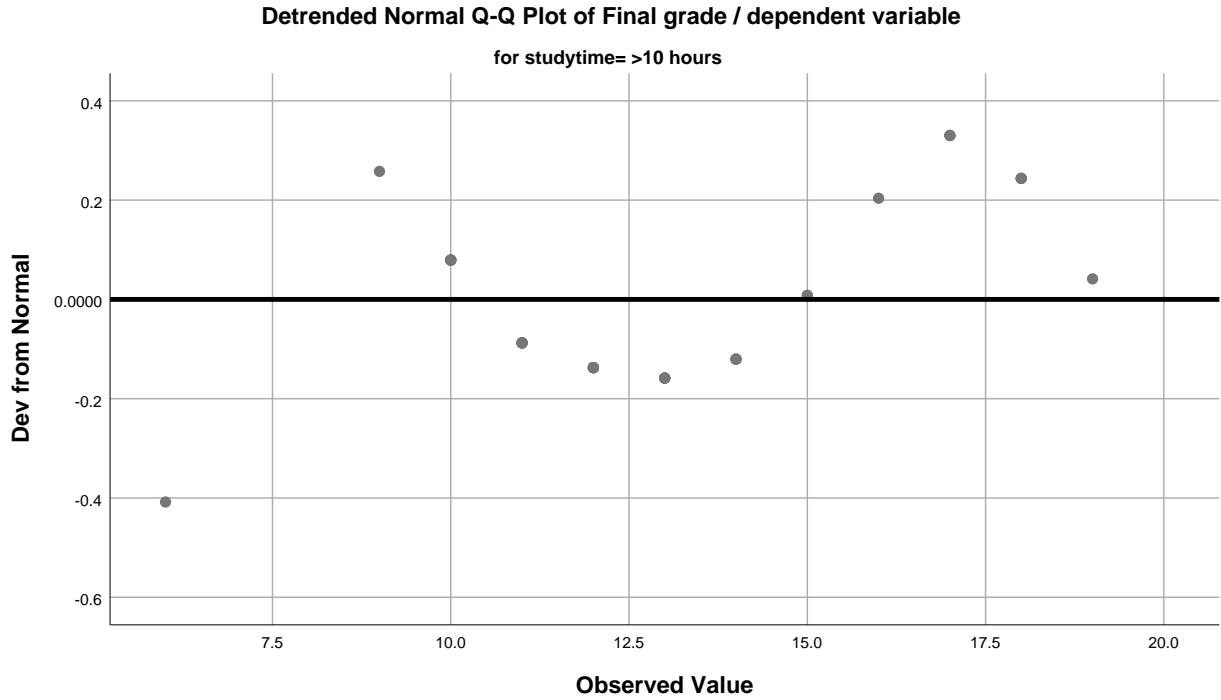
## Detrended Normal Q-Q Plots



Tukey Kramer Test - Distribution Context  
Boxplots, histograms, normal probability plots, and descript



Tukey Kramer Test - Distribution Context  
 Boxplots, histograms, normal probability plots, and descript



Tukey Kramer Test - Main One-Way ANOVA

Tukey Kramer Test - Main One-Way ANOVA  
ANOVA and Levene homogeneity context for G3 by studytime

## Oneway

### Descriptives

Final grade / dependent variable

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum
					Lower Bound	Upper Bound	
1	212	10.8443	3.21862	.22106	10.4086	11.2801	.00
2	305	12.0918	3.24313	.18570	11.7264	12.4572	.00
3	97	13.2268	2.50210	.25405	12.7225	13.7311	8.00
4	35	13.0571	3.03841	.51358	12.0134	14.1009	6.00
Total	649	11.9060	3.23066	.12681	11.6570	12.1550	.00

### Descriptives

Final grade / dependent variable

	Maximum
1	18.00
2	19.00
3	18.00
4	19.00
Total	19.00

### Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Final grade / dependent variable	Based on Mean	.985	3	645	.400
	Based on Median	1.026	3	645	.380
	Based on Median and with adjusted df	1.026	3	609.885	.380
	Based on trimmed mean	1.081	3	645	.356

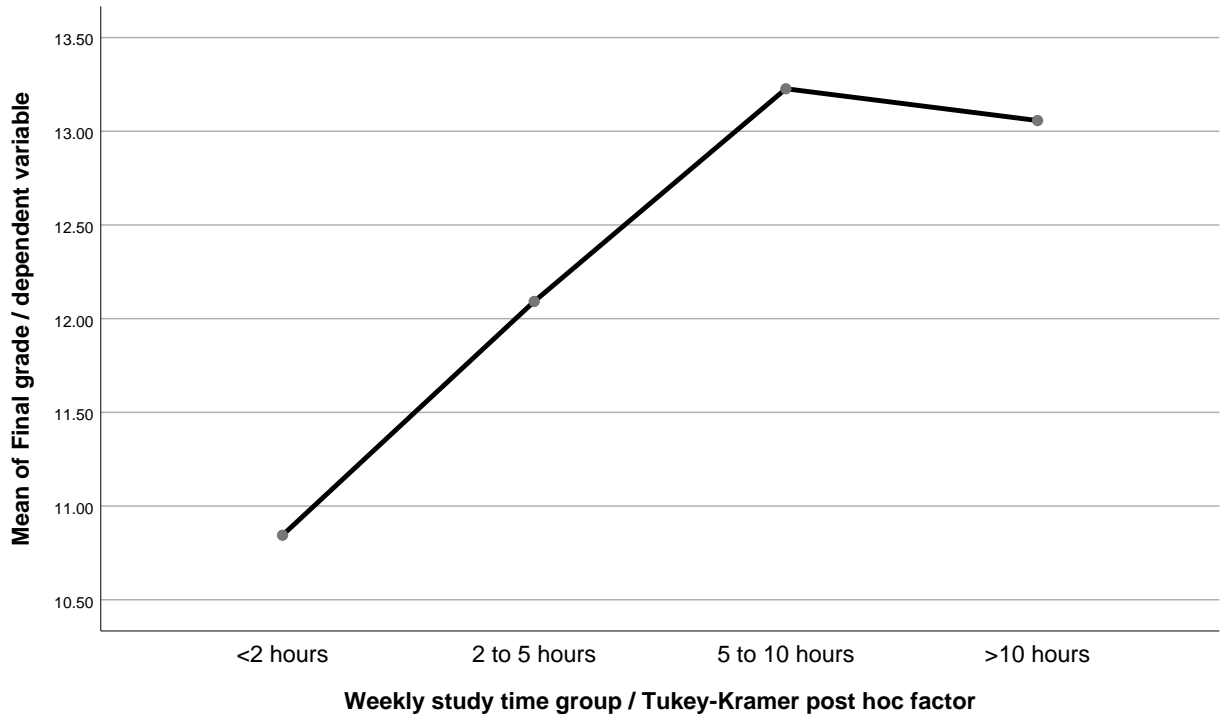
Tukey Kramer Test - Main One-Way ANOVA  
ANOVA and Levene homogeneity context for G3 by studytime

**ANOVA**

Final grade / dependent variable

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	465.078	3	155.026	15.876	.000
Within Groups	6298.189	645	9.765		
Total	6763.267	648			

**Means Plots**



## Tukey Kramer Test - Tukey-Kramer Post Hoc Reference Output

```
>Warning # 2004.  Command name: SUBTITLE  
>The subtitle given exceeds 60 characters in length.  The first 60 characters  
>will be used.
```

Tukey Kramer Test - Tukey-Kramer Post Hoc Reference Output  
 SPSS Tukey post hoc after one-way ANOVA; unequal n interpret

**Oneway**

**Descriptives**

Final grade / dependent variable

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum
					Lower Bound	Upper Bound	
1	212	10.8443	3.21862	.22106	10.4086	11.2801	.00
2	305	12.0918	3.24313	.18570	11.7264	12.4572	.00
3	97	13.2268	2.50210	.25405	12.7225	13.7311	8.00
4	35	13.0571	3.03841	.51358	12.0134	14.1009	6.00
Total	649	11.9060	3.23066	.12681	11.6570	12.1550	.00

**Descriptives**

Final grade / dependent variable

	Maximum
1	18.00
2	19.00
3	18.00
4	19.00
Total	19.00

**Test of Homogeneity of Variances**

		Levene Statistic	df1	df2	Sig.
Final grade / dependent variable	Based on Mean	.985	3	645	.400
	Based on Median	1.026	3	645	.380
	Based on Median and with adjusted df	1.026	3	609.885	.380
	Based on trimmed mean	1.081	3	645	.356

Tukey Kramer Test - Tukey-Kramer Post Hoc Reference Output  
 SPSS Tukey post hoc after one-way ANOVA; unequal n interpret

**ANOVA**

Final grade / dependent variable

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	465.078	3	155.026	15.876	.000
Within Groups	6298.189	645	9.765		
Total	6763.267	648			

**Post Hoc Tests**

**Multiple Comparisons**

Dependent Variable: Final grade / dependent variable

Tukey HSD

(I) Weekly study time group / Tukey-Kramer post hoc factor	(J) Weekly study time group / Tukey-Kramer post hoc factor	Mean Difference (I-J)	Std. Error	Sig.
1	2	-1.24746 <sup>*</sup>	.27942	.000
	3	-2.38246 <sup>*</sup>	.38305	.000
	4	-2.21280 <sup>*</sup>	.57013	.001
2	1	1.24746 <sup>*</sup>	.27942	.000
	3	-1.13500 <sup>*</sup>	.36425	.010
	4	-.96534	.55768	.308
3	1	2.38246 <sup>*</sup>	.38305	.000
	2	1.13500 <sup>*</sup>	.36425	.010
	4	.16966	.61616	.993
4	1	2.21280 <sup>*</sup>	.57013	.001
	2	.96534	.55768	.308
	3	-.16966	.61616	.993

Tukey Kramer Test - Tukey-Kramer Post Hoc Reference Output  
 SPSS Tukey post hoc after one-way ANOVA; unequal n interpret

**Multiple Comparisons**

Dependent Variable: Final grade / dependent variable

Tukey HSD

(I) Weekly study time group / Tukey-Kramer post hoc factor	(J) Weekly study time group / Tukey-Kramer post hoc factor	95% Confidence Interval	
		Lower Bound	Upper Bound
1	2	-1.9672	-.5278
	3	-3.3691	-1.3958
	4	-3.6813	-.7443
2	1	.5278	1.9672
	3	-2.0732	-.1968
	4	-2.4018	.4711
3	1	1.3958	3.3691
	2	.1968	2.0732
	4	-1.4174	1.7567
4	1	.7443	3.6813
	2	-.4711	2.4018
	3	-1.7567	1.4174

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

**Homogeneous Subsets**

Tukey Kramer Test - Tukey-Kramer Post Hoc Reference Output  
 SPSS Tukey post hoc after one-way ANOVA; unequal n interpret

**Final grade / dependent variable**

Tukey HSD<sup>a,b</sup>

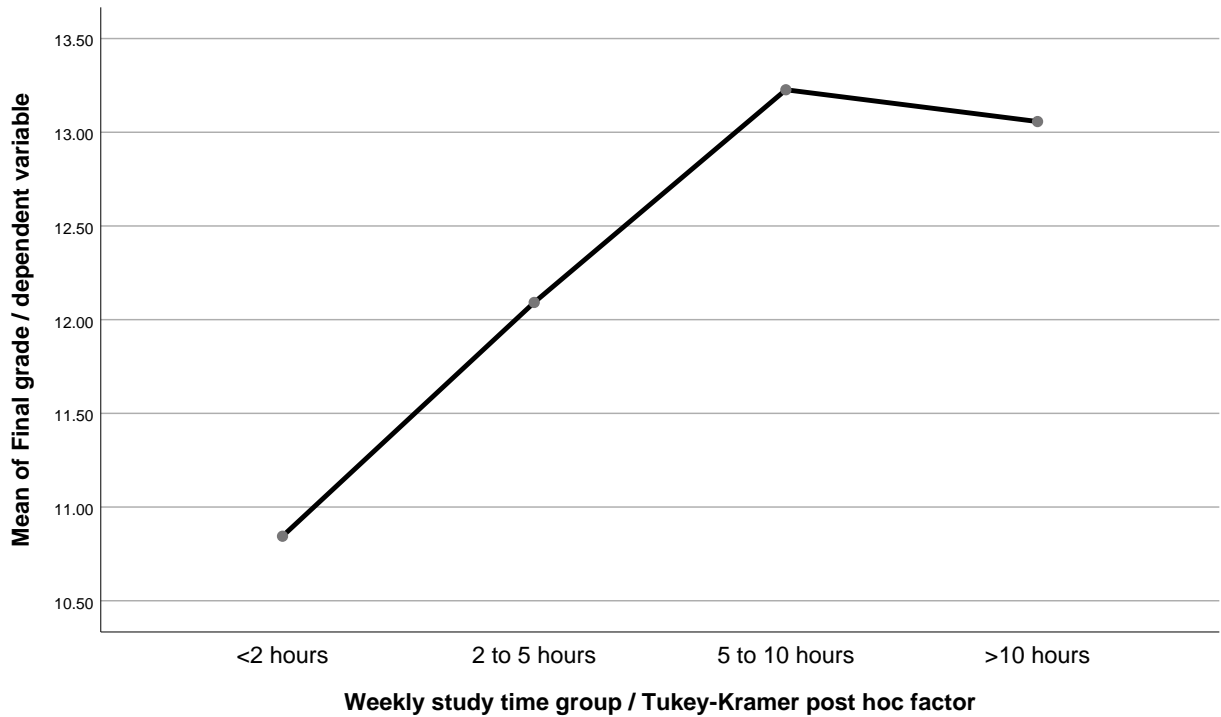
Weekly study time group / Tukey-Kramer post hoc factor	N	Subset for alpha = 0.05	
		1	2
1	212	10.8443	
2	305		12.0918
4	35		13.0571
3	97		13.2268
Sig.		1.000	.083

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 85.331.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

**Means Plots**



## Tukey Kramer Test - Optional Pairwise Report Context

```
>Warning # 2004.  Command name: SUBTITLE  
>The subtitle given exceeds 60 characters in length.  The first 60 characters  
>will be used.
```

Tukey Kramer Test - Optional Pairwise Report Context  
The SPSS multiple-comparisons table is the official SPSS ref

## Oneway

### Descriptives

Final grade / dependent variable

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum
					Lower Bound	Upper Bound	
1	212	10.8443	3.21862	.22106	10.4086	11.2801	.00
2	305	12.0918	3.24313	.18570	11.7264	12.4572	.00
3	97	13.2268	2.50210	.25405	12.7225	13.7311	8.00
4	35	13.0571	3.03841	.51358	12.0134	14.1009	6.00
Total	649	11.9060	3.23066	.12681	11.6570	12.1550	.00

### Descriptives

Final grade / dependent variable

	Maximum
1	18.00
2	19.00
3	18.00
4	19.00
Total	19.00

### Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Final grade / dependent variable	Based on Mean	.985	3	645	.400
	Based on Median	1.026	3	645	.380
	Based on Median and with adjusted df	1.026	3	609.885	.380
	Based on trimmed mean	1.081	3	645	.356

Tukey Kramer Test - Optional Pairwise Report Context  
The SPSS multiple-comparisons table is the official SPSS ref

### ANOVA

Final grade / dependent variable

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	465.078	3	155.026	15.876	.000
Within Groups	6298.189	645	9.765		
Total	6763.267	648			

### Post Hoc Tests

#### Multiple Comparisons

Dependent Variable: Final grade / dependent variable

Tukey HSD

(I) Weekly study time group / Tukey-Kramer post hoc factor	(J) Weekly study time group / Tukey-Kramer post hoc factor	Mean Difference (I-J)	Std. Error	Sig.
1	2	-1.24746 <sup>*</sup>	.27942	.000
	3	-2.38246 <sup>*</sup>	.38305	.000
	4	-2.21280 <sup>*</sup>	.57013	.001
2	1	1.24746 <sup>*</sup>	.27942	.000
	3	-1.13500 <sup>*</sup>	.36425	.010
	4	-.96534	.55768	.308
3	1	2.38246 <sup>*</sup>	.38305	.000
	2	1.13500 <sup>*</sup>	.36425	.010
	4	.16966	.61616	.993
4	1	2.21280 <sup>*</sup>	.57013	.001
	2	.96534	.55768	.308
	3	-.16966	.61616	.993

Tukey Kramer Test - Optional Pairwise Report Context  
The SPSS multiple-comparisons table is the official SPSS ref

### Multiple Comparisons

Dependent Variable: Final grade / dependent variable

Tukey HSD

(I) Weekly study time group / Tukey-Kramer post hoc factor	(J) Weekly study time group / Tukey-Kramer post hoc factor	95% Confidence Interval	
		Lower Bound	Upper Bound
1	2	-1.9672	-.5278
	3	-3.3691	-1.3958
	4	-3.6813	-.7443
2	1	.5278	1.9672
	3	-2.0732	-.1968
	4	-2.4018	.4711
3	1	1.3958	3.3691
	2	.1968	2.0732
	4	-1.4174	1.7567
4	1	.7443	3.6813
	2	-.4711	2.4018
	3	-1.7567	1.4174

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

### Homogeneous Subsets

Tukey Kramer Test - Optional Pairwise Report Context  
The SPSS multiple-comparisons table is the official SPSS ref

**Final grade / dependent variable**

Tukey HSD<sup>a,b</sup>

Weekly study time group / Tukey-Kramer post hoc factor	N	Subset for alpha = 0.05	
		1	2
1	212	10.8443	
2	305		12.0918
4	35		13.0571
3	97		13.2268
Sig.		1.000	.083

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 85.331.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.