

**Host**

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## Levenes Test

Levenes Test  
Import data

Levenes test from ONEWAY

Levenes test from ONEWAY  
G3 by studytime

## Oneway

[LevenesData] D:\DATA ANALYSIS\B Normality and Assumption Tests\Levenes Test\S  
PSS\_Output\sav\Levenes-Test-data.sav

### Descriptives

G3

|       | N   | Mean  | Std. Deviation | Std. Error | 95% Confidence Interval for Mean |             | Minimum |
|-------|-----|-------|----------------|------------|----------------------------------|-------------|---------|
|       |     |       |                |            | Lower Bound                      | Upper Bound |         |
| 1     | 212 | 10.84 | 3.219          | .221       | 10.41                            | 11.28       | 0       |
| 2     | 305 | 12.09 | 3.243          | .186       | 11.73                            | 12.46       | 0       |
| 3     | 97  | 13.23 | 2.502          | .254       | 12.72                            | 13.73       | 8       |
| 4     | 35  | 13.06 | 3.038          | .514       | 12.01                            | 14.10       | 6       |
| Total | 649 | 11.91 | 3.231          | .127       | 11.66                            | 12.16       | 0       |

### Descriptives

G3

|       | Maximum |
|-------|---------|
| 1     | 18      |
| 2     | 19      |
| 3     | 18      |
| 4     | 19      |
| Total | 19      |

### Test of Homogeneity of Variances

|    |                                      | Levene Statistic | df1 | df2     | Sig. |
|----|--------------------------------------|------------------|-----|---------|------|
| G3 | 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 |

Levenes test from ONEWAY  
G3 by studytime

**ANOVA**

G3

|                | Sum of<br>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 |             |        |      |

Group spread plots

Group spread plots  
G3 by studytime

## Explore

### Study time group

#### Case Processing Summary

|    |           | Valid |         | Cases Missing |         | Total |         |
|----|-----------|-------|---------|---------------|---------|-------|---------|
|    | studytime | N     | Percent | N             | Percent | N     | Percent |
| G3 | 1         | 212   | 100.0%  | 0             | 0.0%    | 212   | 100.0%  |
|    | 2         | 305   | 100.0%  | 0             | 0.0%    | 305   | 100.0%  |
|    | 3         | 97    | 100.0%  | 0             | 0.0%    | 97    | 100.0%  |
|    | 4         | 35    | 100.0%  | 0             | 0.0%    | 35    | 100.0%  |

#### Descriptives

| studytime |   |                                  | Statistic   | Std. Error |
|-----------|---|----------------------------------|-------------|------------|
| G3        | 1 | Mean                             | 10.84       | .221       |
|           |   | 95% Confidence Interval for Mean | Lower Bound | 10.41      |
|           |   |                                  | Upper Bound | 11.28      |
|           |   | 5% Trimmed Mean                  | 11.04       |            |
|           |   | Median                           | 11.00       |            |
|           |   | Variance                         | 10.360      |            |
|           |   | Std. Deviation                   | 3.219       |            |
|           |   | Minimum                          | 0           |            |
|           |   | Maximum                          | 18          |            |
|           |   | Range                            | 18          |            |
|           |   | Interquartile Range              | 3           |            |
|           |   | Skewness                         | -1.078      | .167       |
|           |   | Kurtosis                         | 3.117       | .333       |
|           | 2 | Mean                             | 12.09       | .186       |
|           |   | 95% Confidence Interval for Mean | Lower Bound | 11.73      |
|           |   |                                  | Upper Bound | 12.46      |
|           |   | 5% Trimmed Mean                  | 12.25       |            |
|           |   | Median                           | 12.00       |            |
|           |   | Variance                         | 10.518      |            |
|           |   | Std. Deviation                   | 3.243       |            |



Group spread plots  
G3 by studytime

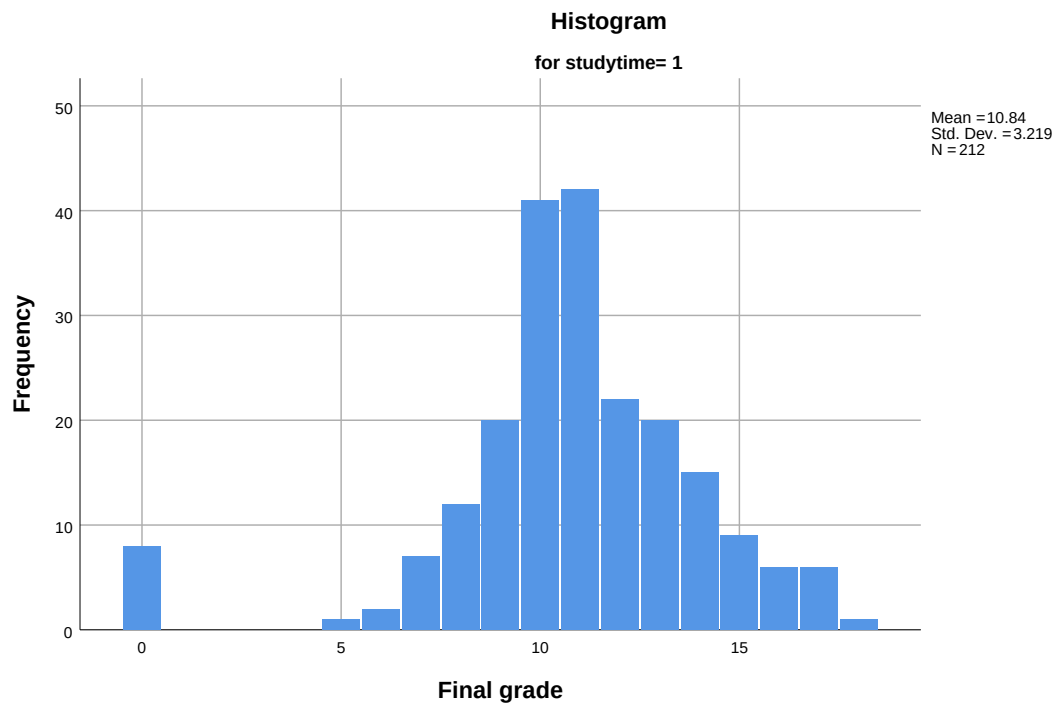
**Descriptives**

| studytime |                                  | Statistic   | Std. Error |
|-----------|----------------------------------|-------------|------------|
| 3         | Minimum                          | 0           |            |
|           | Maximum                          | 19          |            |
|           | Range                            | 19          |            |
|           | Interquartile Range              | 4           |            |
|           | Skewness                         | -1.028      | .140       |
|           | Kurtosis                         | 3.044       | .278       |
|           | Mean                             | 13.23       | .254       |
|           | 95% Confidence Interval for Mean | Lower Bound | 12.72      |
|           |                                  | Upper Bound | 13.73      |
|           | 5% Trimmed Mean                  | 13.27       |            |
|           | Median                           | 13.00       |            |
|           | Variance                         | 6.261       |            |
|           | Std. Deviation                   | 2.502       |            |
|           | Minimum                          | 8           |            |
|           | Maximum                          | 18          |            |
|           | Range                            | 10          |            |
|           | Interquartile Range              | 4           |            |
|           | Skewness                         | -.190       | .245       |
|           | Kurtosis                         | -.502       | .485       |
| 4         | Mean                             | 13.06       | .514       |
|           | 95% Confidence Interval for Mean | Lower Bound | 12.01      |
|           |                                  | Upper Bound | 14.10      |
|           | 5% Trimmed Mean                  | 13.07       |            |
|           | Median                           | 13.00       |            |
|           | Variance                         | 9.232       |            |
|           | Std. Deviation                   | 3.038       |            |
|           | Minimum                          | 6           |            |
|           | Maximum                          | 19          |            |
|           | Range                            | 13          |            |
|           | Interquartile Range              | 4           |            |
|           | Skewness                         | .209        | .398       |
|           | Kurtosis                         | -.339       | .778       |

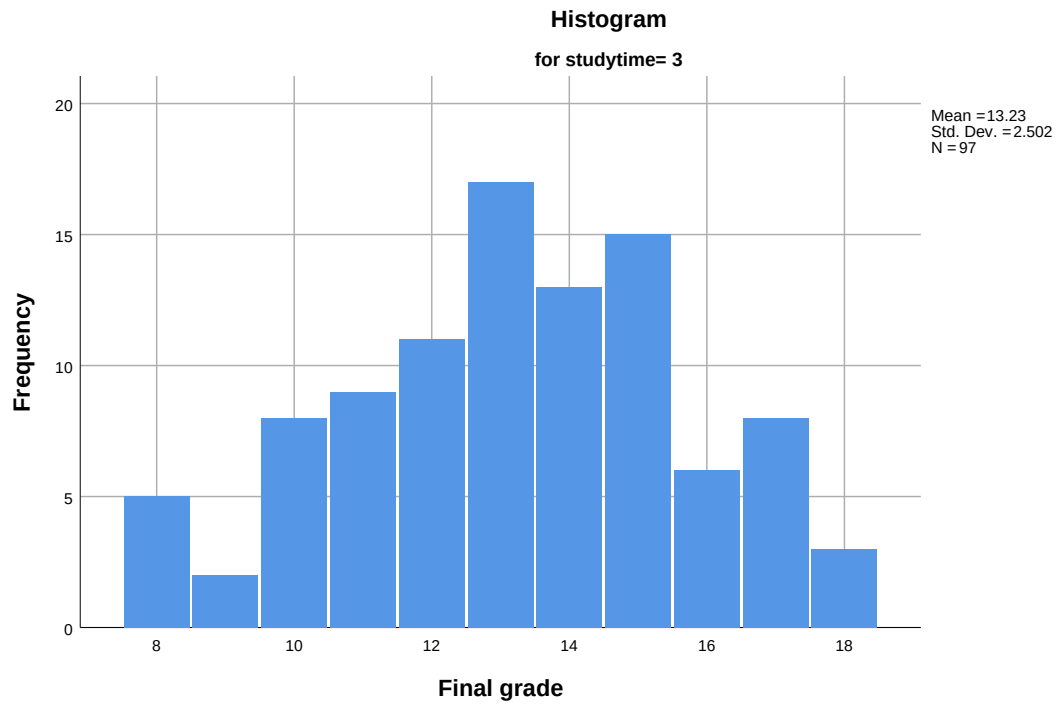
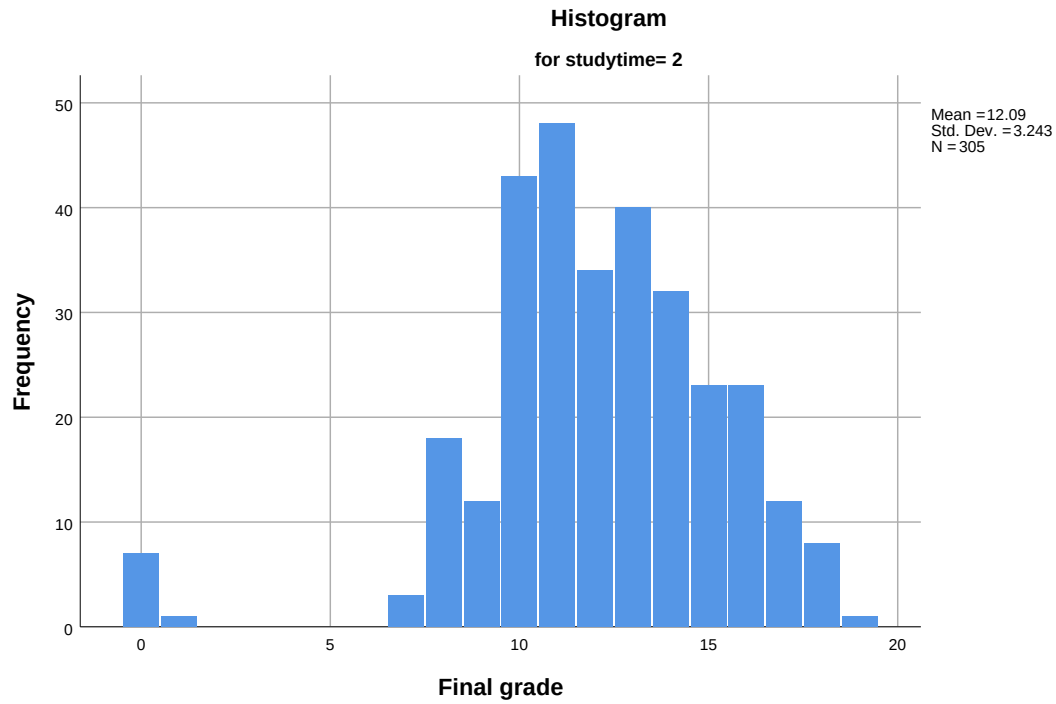
Group spread plots  
G3 by studytime

## Final grade

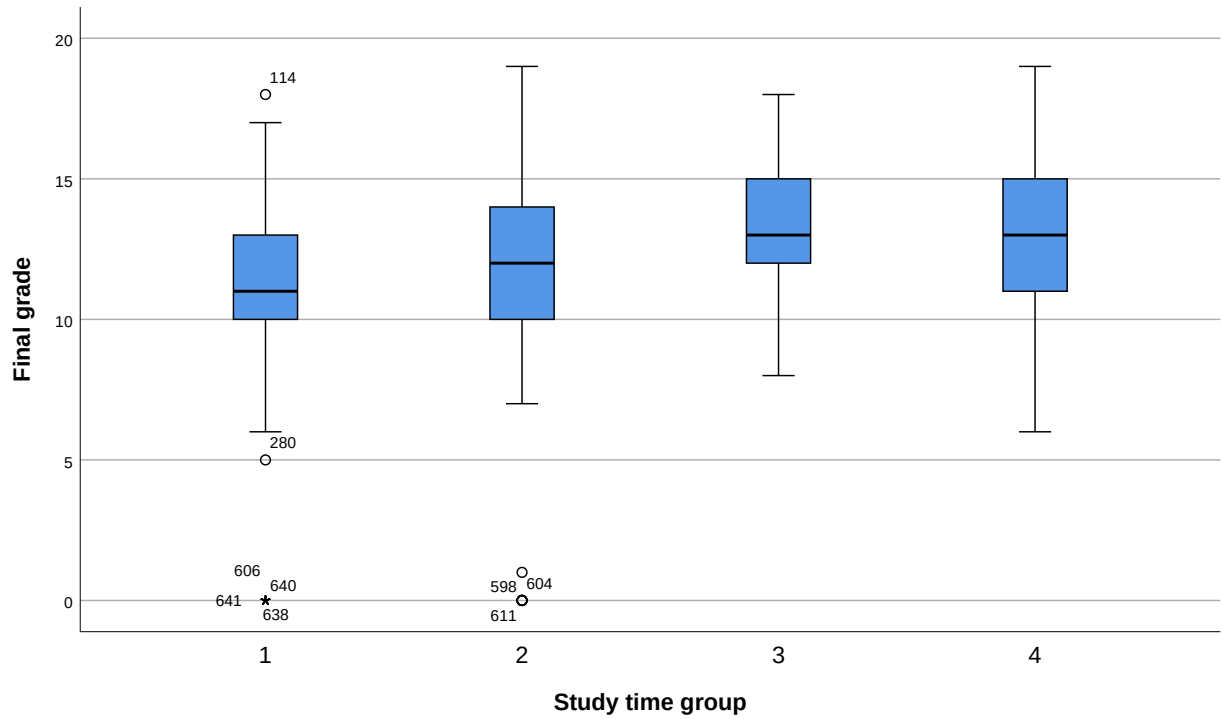
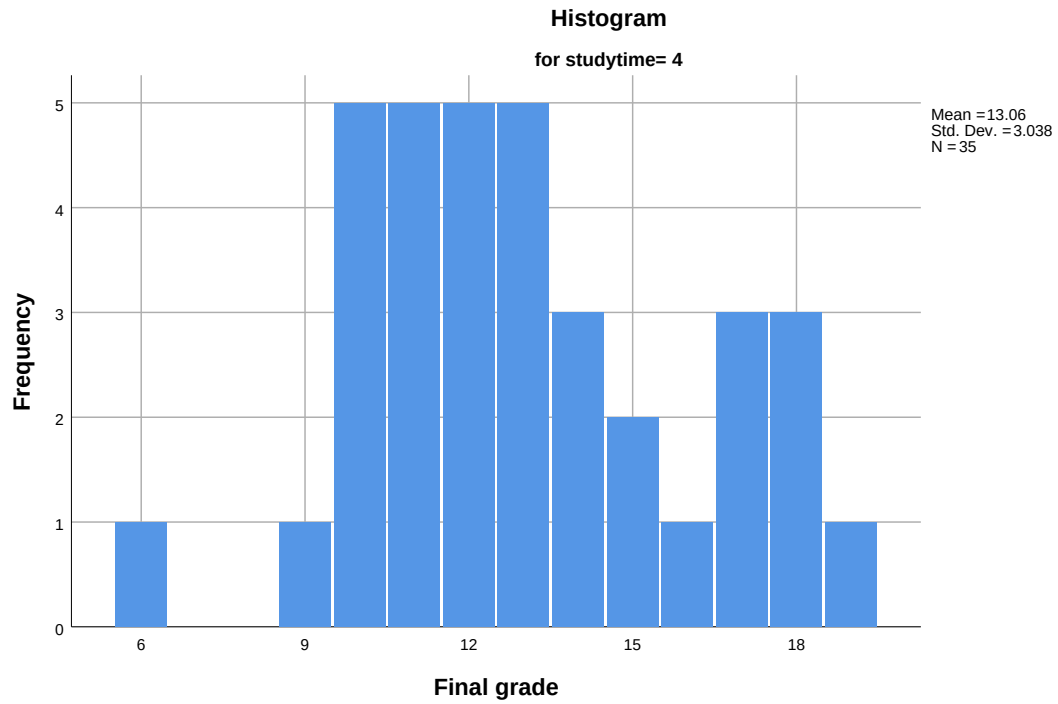
## Histograms



Group spread plots  
G3 by studytime



# Group spread plots G3 by studytime



## Manual Levenes test

Manual Levenes test  
ANOVA on absolute deviations from group mean

## Oneway

[LevenesData] D:\DATA ANALYSIS\B Normality and Assumption Tests\Levenes Test\S  
PSS\_Output\sav\Levenes-Test-with-deviations.sav

### Descriptives

abs\_dev\_mean

|       | N   | Mean   | Std. Deviation | Std. Error | 95% Confidence Interval for Mean |             | Minimum |
|-------|-----|--------|----------------|------------|----------------------------------|-------------|---------|
|       |     |        |                |            | Lower Bound                      | Upper Bound |         |
| 1     | 212 | 2.2154 | 2.32985        | .16001     | 1.9000                           | 2.5309      | .16     |
| 2     | 305 | 2.4081 | 2.16788        | .12413     | 2.1639                           | 2.6524      | .09     |
| 3     | 97  | 2.0164 | 1.46712        | .14896     | 1.7207                           | 2.3121      | .23     |
| 4     | 35  | 2.4147 | 1.79713        | .30377     | 1.7974                           | 3.0320      | .06     |
| Total | 649 | 2.2870 | 2.11686        | .08309     | 2.1238                           | 2.4501      | .06     |

### Descriptives

abs\_dev\_mean

|       | Maximum |
|-------|---------|
| 1     | 10.84   |
| 2     | 12.09   |
| 3     | 5.23    |
| 4     | 7.06    |
| Total | 12.09   |

### ANOVA

abs\_dev\_mean

|                | Sum of Squares | df  | Mean Square | F    | Sig. |
|----------------|----------------|-----|-------------|------|------|
| Between Groups | 13.236         | 3   | 4.412       | .985 | .400 |
| Within Groups  | 2890.501       | 645 | 4.481       |      |      |
| Total          | 2903.737       | 648 |             |      |      |

Brown-Forsythe comparison

Brown-Forsythe comparison  
ANOVA on absolute deviations from group median

## Oneway

### Descriptives

abs\_dev\_median

|       | N   | Mean   | Std. Deviation | Std. Error | 95% Confidence Interval for Mean |             | Minimum |
|-------|-----|--------|----------------|------------|----------------------------------|-------------|---------|
|       |     |        |                |            | Lower Bound                      | Upper Bound |         |
| 1     | 212 | 2.1934 | 2.35586        | .16180     | 1.8744                           | 2.5124      | .00     |
| 2     | 305 | 2.4000 | 2.17885        | .12476     | 2.1545                           | 2.6455      | .00     |
| 3     | 97  | 2.0000 | 1.50693        | .15301     | 1.6963                           | 2.3037      | .00     |
| 4     | 35  | 2.4000 | 1.81821        | .30733     | 1.7754                           | 3.0246      | .00     |
| Total | 649 | 2.2727 | 2.13681        | .08388     | 2.1080                           | 2.4374      | .00     |

### Descriptives

abs\_dev\_median

|       | Maximum |
|-------|---------|
| 1     | 11.00   |
| 2     | 12.00   |
| 3     | 5.00    |
| 4     | 7.00    |
| Total | 12.00   |

### ANOVA

abs\_dev\_median

|                | Sum of Squares | df  | Mean Square | F     | Sig. |
|----------------|----------------|-----|-------------|-------|------|
| Between Groups | 14.057         | 3   | 4.686       | 1.026 | .380 |
| Within Groups  | 2944.671       | 645 | 4.565       |       |      |
| Total          | 2958.727       | 648 |             |       |      |



## Deviation descriptives

Deviation descriptives  
Absolute deviations by studytime

## Means

### Case Processing Summary

|                            | Included |         | Cases Excluded |         | Total |         |
|----------------------------|----------|---------|----------------|---------|-------|---------|
|                            | N        | Percent | N              | Percent | N     | Percent |
| abs_dev_mean * studytime   | 649      | 100.0%  | 0              | 0.0%    | 649   | 100.0%  |
| abs_dev_median * studytime | 649      | 100.0%  | 0              | 0.0%    | 649   | 100.0%  |
| G3 * studytime             | 649      | 100.0%  | 0              | 0.0%    | 649   | 100.0%  |

### Report

| studytime |                | abs_dev_mean | abs_dev_median | G3     |
|-----------|----------------|--------------|----------------|--------|
| 1         | N              | 212          | 212            | 212    |
|           | Mean           | 2.2154       | 2.1934         | 10.84  |
|           | Std. Deviation | 2.32985      | 2.35586        | 3.219  |
|           | Variance       | 5.428        | 5.550          | 10.360 |
| 2         | N              | 305          | 305            | 305    |
|           | Mean           | 2.4081       | 2.4000         | 12.09  |
|           | Std. Deviation | 2.16788      | 2.17885        | 3.243  |
|           | Variance       | 4.700        | 4.747          | 10.518 |
| 3         | N              | 97           | 97             | 97     |
|           | Mean           | 2.0164       | 2.0000         | 13.23  |
|           | Std. Deviation | 1.46712      | 1.50693        | 2.502  |
|           | Variance       | 2.152        | 2.271          | 6.261  |
| 4         | N              | 35           | 35             | 35     |
|           | Mean           | 2.4147       | 2.4000         | 13.06  |
|           | Std. Deviation | 1.79713      | 1.81821        | 3.038  |
|           | Variance       | 3.230        | 3.306          | 9.232  |
| Total     | N              | 649          | 649            | 649    |
|           | Mean           | 2.2870       | 2.2727         | 11.91  |
|           | Std. Deviation | 2.11686      | 2.13681        | 3.231  |
|           | Variance       | 4.481        | 4.566          | 10.437 |

Levenes across alternative grouping variables

Levenes across alternative grouping variables  
G3 by sex and school

## Oneway

### Warnings

Text: sex Command: ONEWAY

A string variable was used in a variable list where only numeric variables are allowed.

Execution of this command stops.

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## Oneway

### Warnings

Text: school Command: ONEWAY

A string variable was used in a variable list where only numeric variables are allowed.

Execution of this command stops.

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