```
* ============================================================.
 422  0 M>  * ============================================================.
* Hartley F Max Test â€” SPSS Step 3 v3 CLEAN.
 423  0 M>  * Hartley F Max Test â€” SPSS Step 3 v3 CLEAN.
* Folder:
 424  0 M>  * Folder:
* D:\low kda score priority basis posts\first post\Hartley F Max Test
 425  0 M>  * D:\low kda score priority basis posts\first post\Hartley F Max T
est
*
 426  0 M>  *
* Purpose:
 427  0 M>  * Purpose:
* 1. Import the clean CSV created by Python/R.
 428  0 M>  * 1. Import the clean CSV created by Python/R.
* 2. Produce clean SPSS output for the Hartley F-Max teaching post.
 429  0 M>  * 2. Produce clean SPSS output for the Hartley F-Max teaching post
.
* 3. Avoid the previous SPSS REPORT page-width error by using LIST tables.
 430  0 M>  * 3. Avoid the previous SPSS REPORT page-width error by using LIST
 tables.
*
 431  0 M>  *
* Important:
 432  0 M>  * Important:
* Hartley's classical F-Max test assumes normality and equal or nearly equal
 433  0 M>  * Hartley's classical F-Max test assumes normality and equal or ne
arly equal
* group sizes. This real dataset is unbalanced, so R/Python permutation
 434  0 M>  * group sizes. This real dataset is unbalanced, so R/Python permut
ation
* results remain the stronger source for final inference. SPSS is used here
 435  0 M>  * results remain the stronger source for final inference. SPSS is
used here
* for verification, descriptive tables, Levene comparison and output PDF.
 436  0 M>  * for verification, descriptive tables, Levene comparison and outp
ut PDF.
* ============================================================.
 437  0 M>  * ============================================================.

 438  0 M>
SET DECIMAL DOT.
```

```
 439  0 M>  SET DECIMAL DOT.
SET PRINTBACK ON.
 440  0 M>  SET PRINTBACK ON.
SET MPRINT ON.
 441  0 M>  SET MPRINT ON.
SET TVARS NAMES.
 442  0 M>  SET TVARS NAMES.
SET TNUMBERS VALUES.
 443  0 M>  SET TNUMBERS VALUES.

 444  0 M>
CD 'D:\low kda score priority basis posts\first post\Hartley F Max Test'.
 445  0 M>  CD 'D:\low kda score priority basis posts\first post\Hartley F Max
 Test'.

 446  0 M>
HOST COMMAND=['cmd /c if not exist "D:\low kda score priority basis posts\firs
t post\Hartley F Max Test\SPSS" mkdir "D:\low kda score priority basis posts\f
irst post\Hartley F Max Test\SPSS"'].
 447  0 M>  HOST COMMAND=['cmd /c if not exist "D:\low kda score priority basi
s posts\first post\Hartley F Max Test\SPSS" mkdir "D:\
               low kda score priority basis posts\first post\Hartley F Max Tes
t\SPSS"'].
```

Host

```
 448  0 M>
* ------------------------------------------------------------.
 449  0 M>  * ------------------------------------------------------------.
* 1. Import clean CSV created by R/Python.
 450  0 M>  * 1. Import clean CSV created by R/Python.
* ------------------------------------------------------------.
 451  0 M>  * ------------------------------------------------------------.

 452  0 M>
GET DATA
 453  0 M>  GET DATA
  /TYPE=TXT
 454  0 M>    /TYPE=TXT
  /FILE='D:\low kda score priority basis posts\first post\Hartley F Max Test\s
tudent_por_hartley_fmax_clean.csv'
```

```
 455  0 M>    /FILE='D:\low kda score priority basis posts\first post\Hartley
F Max Test\student_por_hartley_fmax_clean.csv'
  /ENCODING='UTF8'
 456  0 M>    /ENCODING='UTF8'
  /DELCASE=LINE
 457  0 M>    /DELCASE=LINE
  /DELIMITERS=","
 458  0 M>    /DELIMITERS=","
  /QUALIFIER='"'
 459  0 M>    /QUALIFIER='"'
  /ARRANGEMENT=DELIMITED
 460  0 M>    /ARRANGEMENT=DELIMITED
  /FIRSTCASE=2
 461  0 M>    /FIRSTCASE=2
  /DATATYPEMIN PERCENTAGE=95.0
 462  0 M>    /DATATYPEMIN PERCENTAGE=95.0
  /VARIABLES=
 463  0 M>    /VARIABLES=
    case_id F8.0
 464  0 M>      case_id F8.0
    school A10
 465  0 M>      school A10
    sex A10
 466  0 M>      sex A10
    age F8.0
 467  0 M>      age F8.0
    address A10
 468  0 M>      address A10
    famsize A10
 469  0 M>      famsize A10
    Pstatus A10
 470  0 M>      Pstatus A10
    Medu F8.0
 471  0 M>      Medu F8.0
    Fedu F8.0
 472  0 M>      Fedu F8.0
    Mjob A20
 473  0 M>      Mjob A20
    Fjob A20
 474  0 M>      Fjob A20
    reason A20
 475  0 M>      reason A20
```

```
   guardian A20
476  0 M>      guardian A20
   traveltime F8.0
477  0 M>      traveltime F8.0
   studytime F8.0
478  0 M>      studytime F8.0
   failures F8.0
479  0 M>      failures F8.0
   schoolsup A10
480  0 M>      schoolsup A10
   famsup A10
481  0 M>      famsup A10
   paid A10
482  0 M>      paid A10
   activities A10
483  0 M>      activities A10
   nursery A10
484  0 M>      nursery A10
   higher A10
485  0 M>      higher A10
   internet A10
486  0 M>      internet A10
   romantic A10
487  0 M>      romantic A10
   famrel F8.0
488  0 M>      famrel F8.0
   freetime F8.0
489  0 M>      freetime F8.0
   goout F8.0
490  0 M>      goout F8.0
   Dalc F8.0
491  0 M>      Dalc F8.0
   Walc F8.0
492  0 M>      Walc F8.0
   health F8.0
493  0 M>      health F8.0
   absences F8.0
494  0 M>      absences F8.0
   G1 F8.2
495  0 M>      G1 F8.2
   G2 F8.2
496  0 M>      G2 F8.2
```

```
    G3 F8.2
 497  0 M>      G3 F8.2
    studytime_group A30
 498  0 M>      studytime_group A30
    failures_group A20.
 499  0 M>      failures_group A20.
CACHE.
 500  0 M>  CACHE.
EXECUTE.
 501  0 M>  EXECUTE.

 502  0 M>
DATASET NAME HartleyData WINDOW=FRONT.
 503  0 M>  DATASET NAME HartleyData WINDOW=FRONT.
```

Dataset Name

Warnings

The active dataset will replace the existing dataset named HartleyData.

```
 504  0 M>
VARIABLE LABELS
 505  0 M>  VARIABLE LABELS
 case_id 'Case ID'
 506  0 M>   case_id 'Case ID'
 school 'School'
 507  0 M>   school 'School'
 sex 'Sex'
 508  0 M>   sex 'Sex'
 age 'Age'
 509  0 M>   age 'Age'
 address 'Home address type'
 510  0 M>   address 'Home address type'
 famsize 'Family size'
 511  0 M>   famsize 'Family size'
 Pstatus 'Parent cohabitation status'
 512  0 M>   Pstatus 'Parent cohabitation status'
 Medu 'Mother education'
 513  0 M>   Medu 'Mother education'
 Fedu 'Father education'
 514  0 M>   Fedu 'Father education'
```

```
 traveltime 'Home to school travel time'
 515  0 M>   traveltime 'Home to school travel time'
 studytime 'Weekly study time'
 516  0 M>   studytime 'Weekly study time'
 failures 'Past class failures'
 517  0 M>   failures 'Past class failures'
 famrel 'Family relationship quality'
 518  0 M>   famrel 'Family relationship quality'
 freetime 'Free time after school'
 519  0 M>   freetime 'Free time after school'
 goout 'Going out with friends'
 520  0 M>   goout 'Going out with friends'
 Dalc 'Workday alcohol consumption'
 521  0 M>   Dalc 'Workday alcohol consumption'
 Walc 'Weekend alcohol consumption'
 522  0 M>   Walc 'Weekend alcohol consumption'
 health 'Current health status'
 523  0 M>   health 'Current health status'
 absences 'School absences'
 524  0 M>   absences 'School absences'
 G1 'First period grade'
 525  0 M>   G1 'First period grade'
 G2 'Second period grade'
 526  0 M>   G2 'Second period grade'
 G3 'Final grade'
 527  0 M>   G3 'Final grade'
 studytime_group 'Study time group'
 528  0 M>   studytime_group 'Study time group'
 failures_group 'Failures group'.
 529  0 M>   failures_group 'Failures group'.

 530  0 M>
VALUE LABELS studytime
 531  0 M>  VALUE LABELS studytime
 1 '1: <2 hours'
 532  0 M>   1 '1: <2 hours'
 2 '2: 2 to 5 hours'
 533  0 M>   2 '2: 2 to 5 hours'
 3 '3: 5 to 10 hours'
 534  0 M>   3 '3: 5 to 10 hours'
 4 '4: >10 hours'.
 535  0 M>   4 '4: >10 hours'.
```

```
 536  0 M>
VALUE LABELS traveltime
 537  0 M>  VALUE LABELS traveltime
 1 '<15 min'
 538  0 M>   1 '<15 min'
 2 '15 to 30 min'
 539  0 M>   2 '15 to 30 min'
 3 '30 min to 1 hour'
 540  0 M>   3 '30 min to 1 hour'
 4 '>1 hour'.
 541  0 M>   4 '>1 hour'.

 542  0 M>
VALUE LABELS failures
 543  0 M>  VALUE LABELS failures
 0 '0 failures'
 544  0 M>   0 '0 failures'
 1 '1 failure'
 545  0 M>   1 '1 failure'
 2 '2 failures'
 546  0 M>   2 '2 failures'
 3 '3 failures'.
 547  0 M>   3 '3 failures'.

 548  0 M>
VALUE LABELS Medu Fedu
 549  0 M>  VALUE LABELS Medu Fedu
 0 'None'
 550  0 M>   0 'None'
 1 'Primary education'
 551  0 M>   1 'Primary education'
 2 '5th to 9th grade'
 552  0 M>   2 '5th to 9th grade'
 3 'Secondary education'
 553  0 M>   3 'Secondary education'
 4 'Higher education'.
 554  0 M>   4 'Higher education'.

 555  0 M>
VALUE LABELS health
 556  0 M>  VALUE LABELS health
```

```
 1 'Very bad'
 557  0 M>   1 'Very bad'
 2 'Bad'
 558  0 M>   2 'Bad'
 3 'Average'
 559  0 M>   3 'Average'
 4 'Good'
 560  0 M>   4 'Good'
 5 'Very good'.
 561  0 M>   5 'Very good'.

 562  0 M>
FORMATS case_id age Medu Fedu traveltime studytime failures famrel freetime go
out Dalc Walc health absences G1 G2 G3 (F8.2).
 563  0 M>  FORMATS case_id age Medu Fedu traveltime studytime failures famrel
 freetime goout Dalc Walc health absences G1 G2 G3 (F8
               .2).
EXECUTE.
 564  0 M>  EXECUTE.

 565  0 M>
SAVE OUTFILE='D:\low kda score priority basis posts\first post\Hartley F Max T
est\SPSS\student_por_hartley_fmax_clean_spss_v3.sav'
 566  0 M>  SAVE OUTFILE='D:\low kda score priority basis posts\first post\Har
tley F Max Test\SPSS\student_por_hartley_fmax_clean_sp
               ss_v3.sav'
 /COMPRESSED.
 567  0 M>   /COMPRESSED.

 568  0 M>
* ------------------------------------------------------------.
 569  0 M>  * ------------------------------------------------------------.
* 2. Basic data check.
 570  0 M>  * 2. Basic data check.
* ------------------------------------------------------------.
 571  0 M>  * ------------------------------------------------------------.

 572  0 M>
TITLE 'Hartley F Max Test SPSS Output'.
 573  0 M>  TITLE 'Hartley F Max Test SPSS Output'.
```

```
SUBTITLE 'Data check and study time groups'.
 574  0 M>  SUBTITLE 'Data check and study time groups'.
```

```
 575  0 M>
FREQUENCIES VARIABLES=school sex address famsize Pstatus studytime failures st
udytime_group failures_group
 576  0 M>  FREQUENCIES VARIABLES=school sex address famsize Pstatus studytime
 failures studytime_group failures_group
 /ORDER=ANALYSIS.
 577  0 M>   /ORDER=ANALYSIS.
```

Frequencies

```
[HartleyData] D:\low kda score priority basis posts\first post\Hartley F Max T
est\SPSS\student_por_hartley_fmax_clean_spss_v3.sav
```

Statistics

		school	sex	address	famsize	Pstatus	studytime	failures
N	Valid	649	649	649	649	649	649	649
	Missing	0	0	0	0	0	0	0

Statistics

		studytime_group	failures_group
N	Valid	649	649
	Missing	0	0

Frequency Table

school

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	GP	423	65.2	65.2	65.2
	MS	226	34.8	34.8	100.0
	Total	649	100.0	100.0	

Hartley F Max Test SPSS Output
Data check and study time groups

sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	F	383	59.0	59.0	59.0
	M	266	41.0	41.0	100.0
	Total	649	100.0	100.0	

address

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	R	197	30.4	30.4	30.4
	U	452	69.6	69.6	100.0
	Total	649	100.0	100.0	

famsize

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	GT3	457	70.4	70.4	70.4
	LE3	192	29.6	29.6	100.0
	Total	649	100.0	100.0	

Pstatus

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	A	80	12.3	12.3	12.3
	T	569	87.7	87.7	100.0
	Total	649	100.0	100.0	

Hartley F Max Test SPSS Output
Data check and study time groups

studytime

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	212	32.7	32.7	32.7
	2.00	305	47.0	47.0	79.7
	3.00	97	14.9	14.9	94.6
	4.00	35	5.4	5.4	100.0
	Total	649	100.0	100.0	

failures

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	549	84.6	84.6	84.6
	1.00	70	10.8	10.8	95.4
	2.00	16	2.5	2.5	97.8
	3.00	14	2.2	2.2	100.0
	Total	649	100.0	100.0	

studytime_group

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1: <2 hours	212	32.7	32.7	32.7
	2: 2 to 5 hours	305	47.0	47.0	79.7
	3: 5 to 10 hours	97	14.9	14.9	94.6
	4: >10 hours	35	5.4	5.4	100.0
	Total	649	100.0	100.0	

Hartley F Max Test SPSS Output
Data check and study time groups

failures_group

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 failures	549	84.6	84.6	84.6
	1 failure	70	10.8	10.8	95.4
	2 failures	16	2.5	2.5	97.8
	3 failures	14	2.2	2.2	100.0
	Total	649	100.0	100.0	

```
 578  0 M>
DESCRIPTIVES VARIABLES=G1 G2 G3 absences studytime failures Medu Fedu health
 579  0 M>  DESCRIPTIVES VARIABLES=G1 G2 G3 absences studytime failures Medu F
edu health
 /STATISTICS=MEAN STDDEV MIN MAX.
 580  0 M>   /STATISTICS=MEAN STDDEV MIN MAX.
```

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
G1	649	.00	19.00	11.3991	2.74527
G2	649	.00	19.00	11.5701	2.91364
G3	649	.00	19.00	11.9060	3.23066
absences	649	.00	32.00	3.6595	4.64076
studytime	649	1.00	4.00	1.9307	.82951
failures	649	.00	3.00	.2219	.59324
Medu	649	.00	4.00	2.5146	1.13455
Fedu	649	.00	4.00	2.3066	1.09993
health	649	1.00	5.00	3.5362	1.44626
Valid N (listwise)	649				

```
 581  0 M>
* ------------------------------------------------------------.
 582  0 M>  * ------------------------------------------------------------.
* 3. Main SPSS verification: G3 by studytime.
 583  0 M>  * 3. Main SPSS verification: G3 by studytime.
* ------------------------------------------------------------.
```

```
 584  0 M>  * ------------------------------------------------------------.

 585  0 M>
TITLE 'Hartley F-Max Example: G3 by Study Time'.
 586  0 M>  TITLE 'Hartley F-Max Example: G3 by Study Time'.
```

```
 587  0 M>
MEANS TABLES=G3 BY studytime
 588  0 M>  MEANS TABLES=G3 BY studytime
 /CELLS=COUNT MEAN MEDIAN STDDEV VARIANCE MIN MAX SEMEAN.
 589  0 M>   /CELLS=COUNT MEAN MEDIAN STDDEV VARIANCE MIN MAX SEMEAN.
```

Means

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
G3 * studytime	649	100.0%	0	0.0%	649	100.0%

Report

G3

studytime	N	Mean	Median	Std. Deviation	Variance	Minimum	Maximum
1.00	212	10.8443	11.0000	3.21862	10.360	.00	18.00
2.00	305	12.0918	12.0000	3.24313	10.518	.00	19.00
3.00	97	13.2268	13.0000	2.50210	6.261	8.00	18.00
4.00	35	13.0571	13.0000	3.03841	9.232	6.00	19.00
Total	649	11.9060	12.0000	3.23066	10.437	.00	19.00

Report

G3

studytime	Std. Error of Mean
1.00	.22106
2.00	.18570
3.00	.25405
4.00	.51358
Total	.12681

```
 590  0 M>
EXAMINE VARIABLES=G3 BY studytime
 591  0 M>  EXAMINE VARIABLES=G3 BY studytime
 /PLOT BOXPLOT NPPLOT
```

```
592  0 M>   /PLOT BOXPLOT NPPLOT
/COMPARE GROUPS
593  0 M>   /COMPARE GROUPS
/STATISTICS DESCRIPTIVES
594  0 M>   /STATISTICS DESCRIPTIVES
/CINTERVAL 95
595  0 M>   /CINTERVAL 95
/MISSING LISTWISE
596  0 M>   /MISSING LISTWISE
/NOTOTAL.
597  0 M>   /NOTOTAL.
```

Explore

Weekly study time

Case Processing Summary

		Cases					
		Valid		Missing		Total	
	studytime	N	Percent	N	Percent	N	Percent
G3	1.00	212	100.0%	0	0.0%	212	100.0%
	2.00	305	100.0%	0	0.0%	305	100.0%
	3.00	97	100.0%	0	0.0%	97	100.0%
	4.00	35	100.0%	0	0.0%	35	100.0%

Hartley F-Max Example: G3 by Study Time

Descriptives

	studytime			Statistic	Std. Error
G3	1.00	Mean		10.8443	.22106
		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	.167
		Kurtosis		3.117	.333
	2.00	Mean		12.0918	.18570
		95% Confidence Interval for Mean	Lower Bound	11.7264	
			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	.140
		Kurtosis		3.044	.278
	3.00	Mean		13.2268	.25405
		95% Confidence Interval for Mean	Lower Bound	12.7225	
			Upper Bound	13.7311	
		5% Trimmed Mean		13.2732	
		Median		13.0000	
		Variance		6.261	
		Std. Deviation		2.50210	

Hartley F-Max Example: G3 by Study Time

Descriptives

studytime			Statistic	Std. Error
	Minimum		8.00	
	Maximum		18.00	
	Range		10.00	
	Interquartile Range		3.50	
	Skewness		-.190	.245
	Kurtosis		-.502	.485
4.00	Mean		13.0571	.51358
	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	.398
	Kurtosis		-.339	.778

Tests of Normality

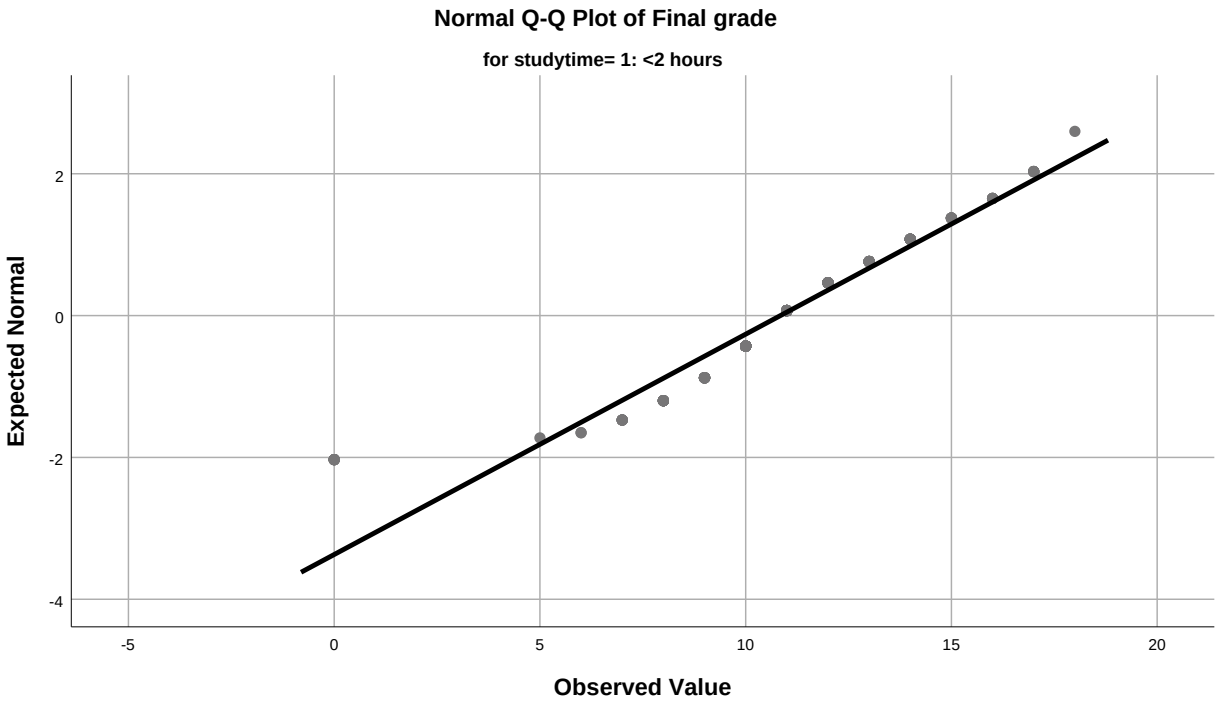
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	studytime	Statistic	df	Sig.	Statistic	df	Sig.
G3	1.00	.161	212	.000	.898	212	.000
	2.00	.125	305	.000	.917	305	.000
	3.00	.103	97	.013	.970	97	.025
	4.00	.136	35	.099	.955	35	.166

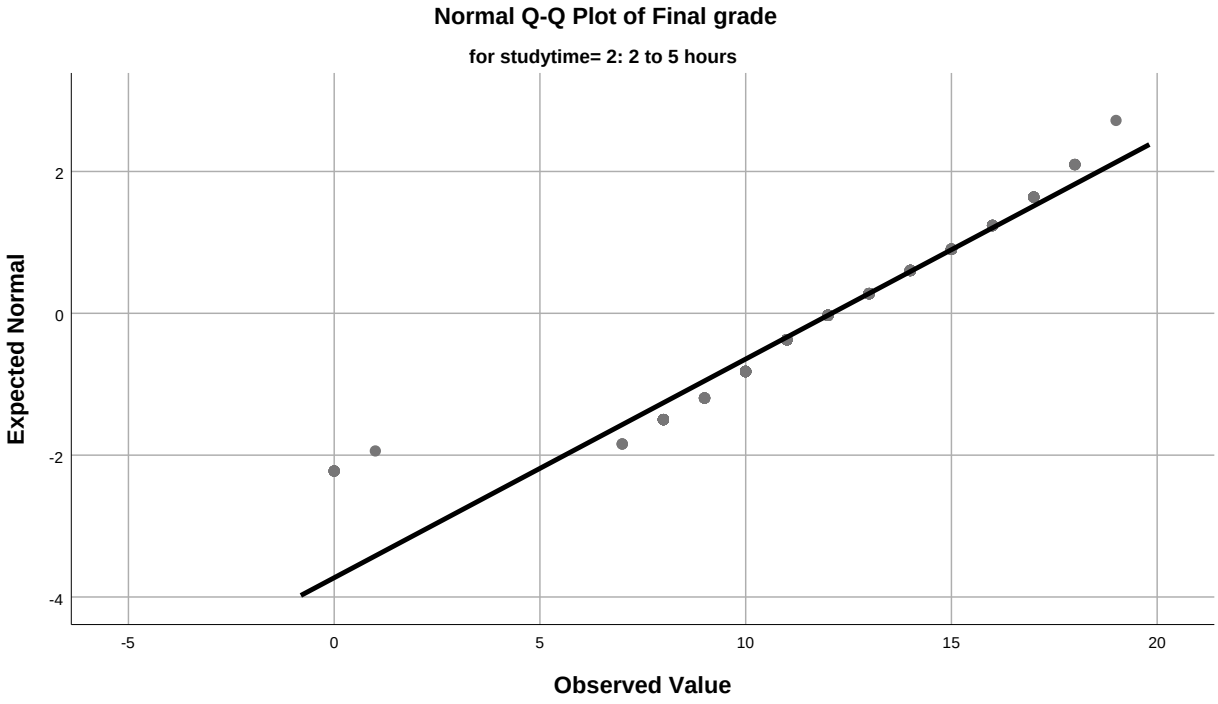
a. Lilliefors Significance Correction

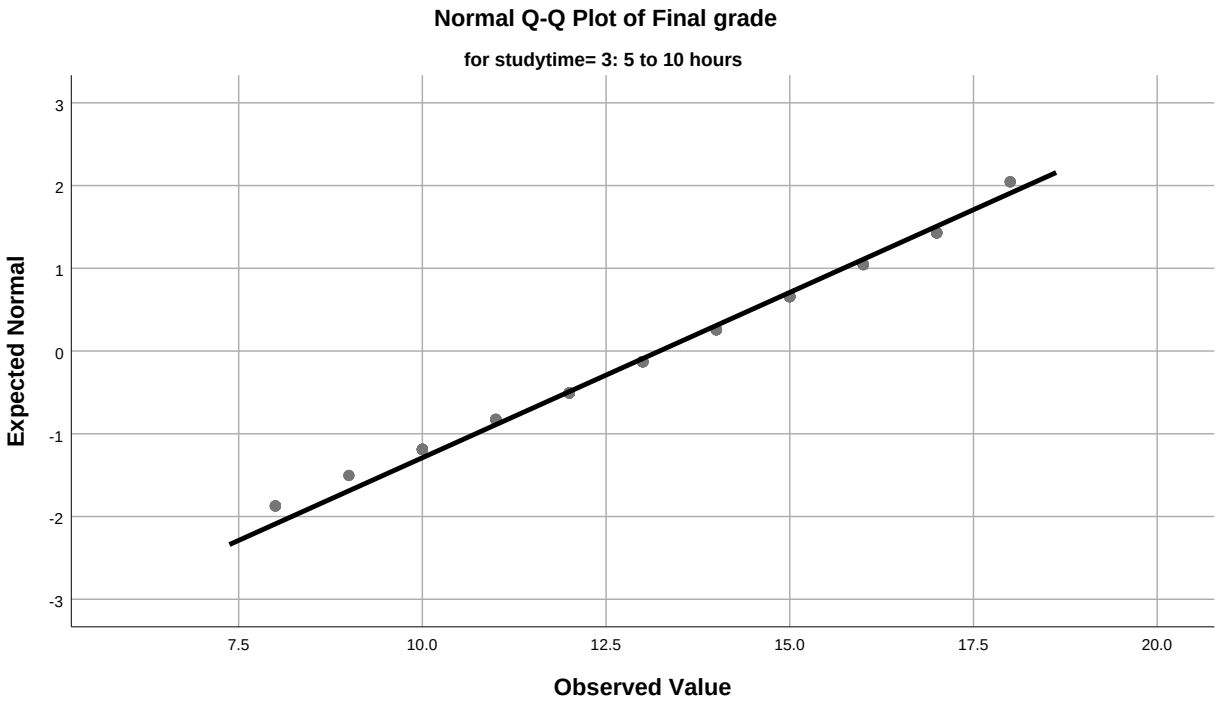
Final grade

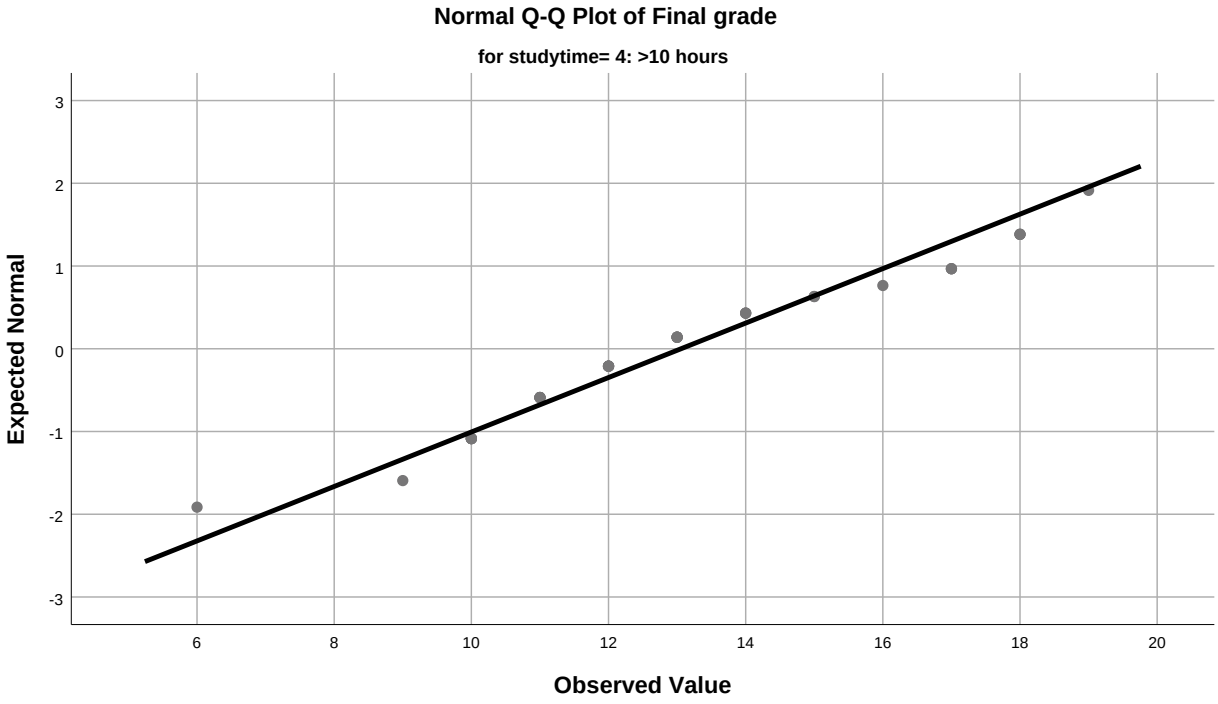
Normal Q-Q Plots

Hartley F-Max Example: G3 by Study Time



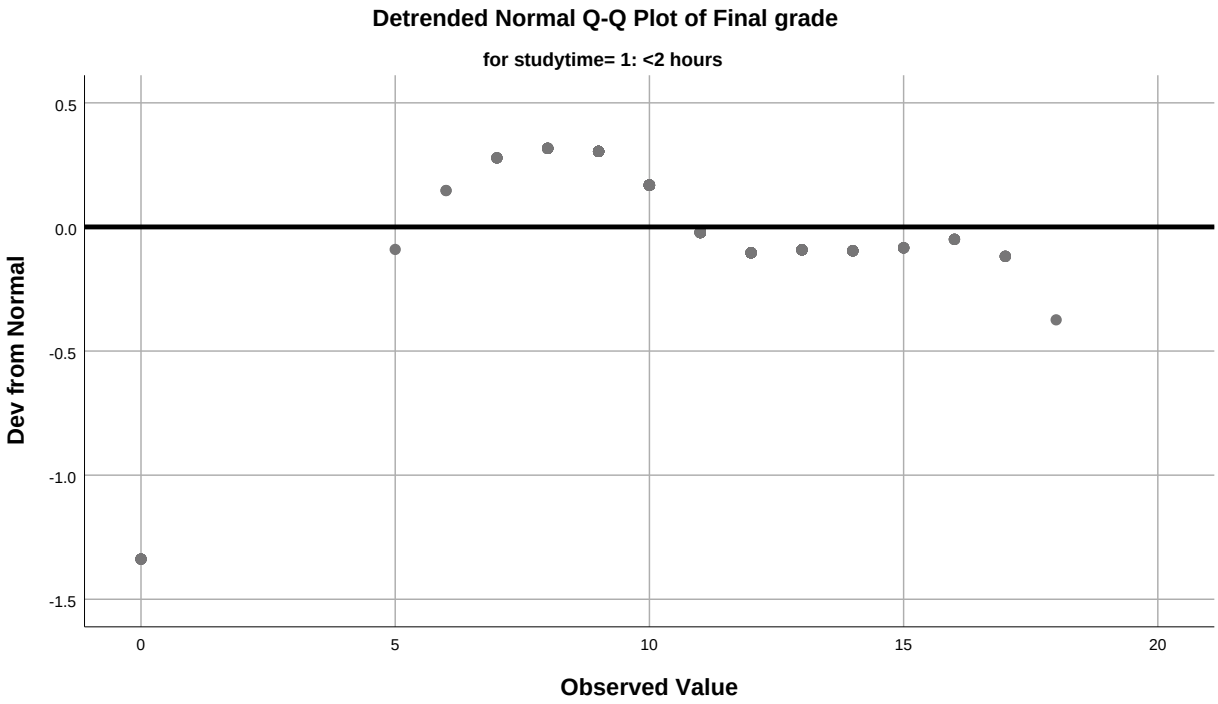


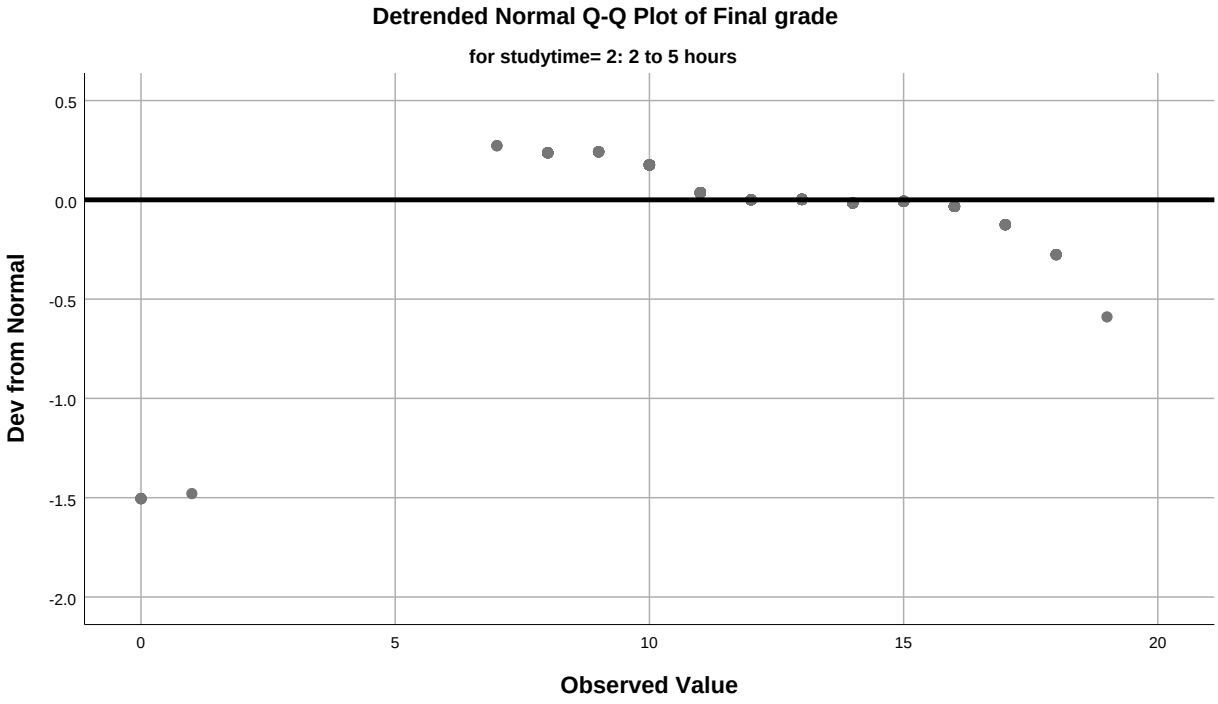




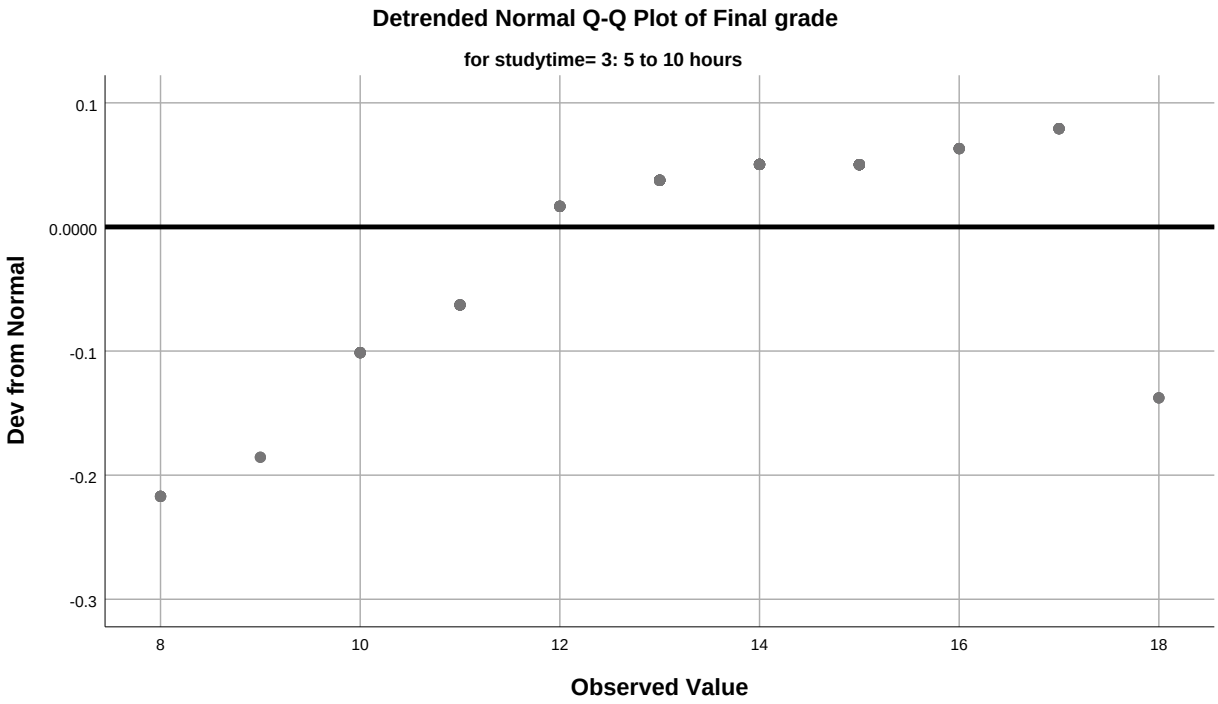
Detrended Normal Q-Q Plots

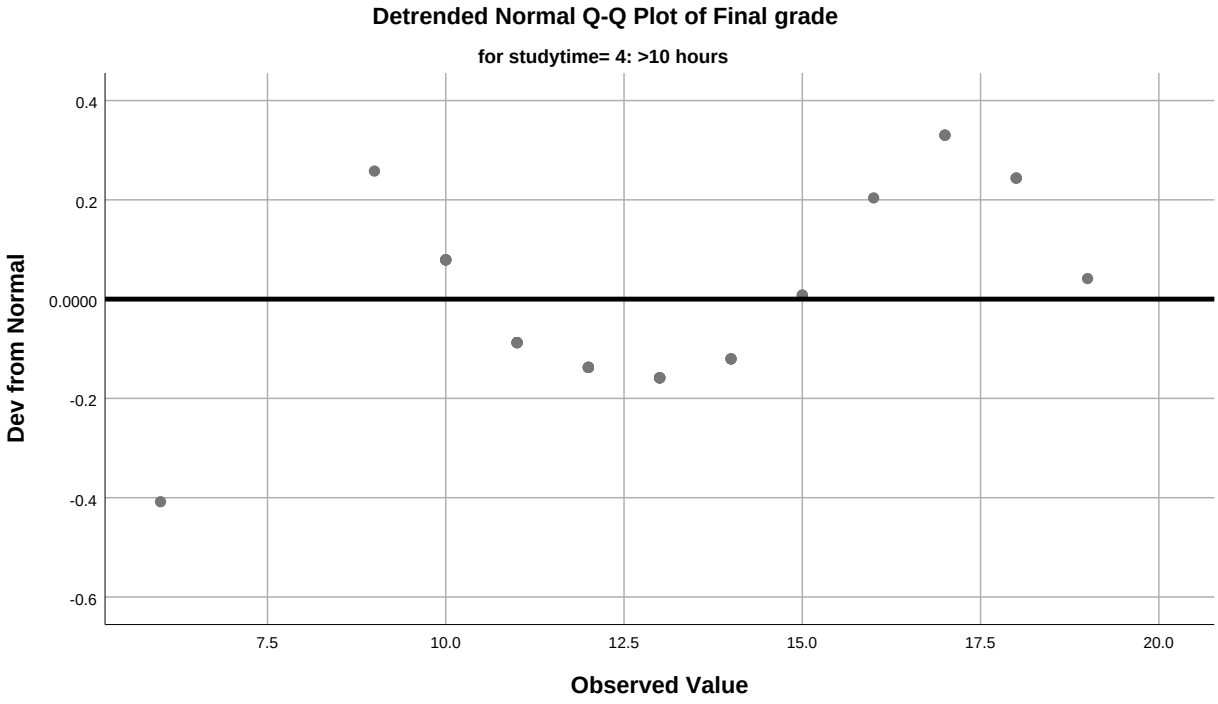
Hartley F-Max Example: G3 by Study Time



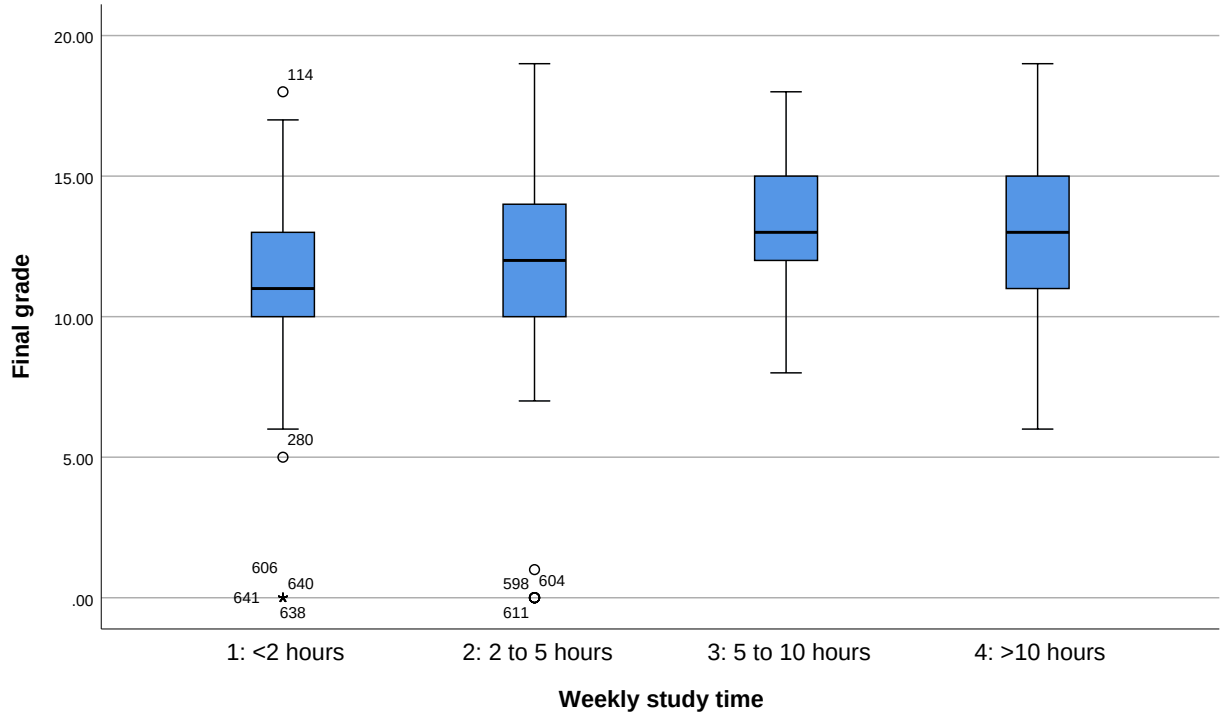


Hartley F-Max Example: G3 by Study Time





Hartley F-Max Example: G3 by Study Time




```
 598  0 M>
ONEWAY G3 BY studytime
 599  0 M>  ONEWAY G3 BY studytime
 /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 600  0 M>   /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 /MISSING ANALYSIS.
 601  0 M>   /MISSING ANALYSIS.
```

Oneway

Descriptives

G3

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum
					Lower Bound	Upper Bound	
1.00	212	10.8443	3.21862	.22106	10.4086	11.2801	.00
2.00	305	12.0918	3.24313	.18570	11.7264	12.4572	.00
3.00	97	13.2268	2.50210	.25405	12.7225	13.7311	8.00
4.00	35	13.0571	3.03841	.51358	12.0134	14.1009	6.00
Total	649	11.9060	3.23066	.12681	11.6570	12.1550	.00

Hartley F-Max Example: G3 by Study Time

Descriptives

G3

	Maximum
1.00	18.00
2.00	19.00
3.00	18.00
4.00	19.00
Total	19.00

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

ANOVA

G3

	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			

Robust Tests of Equality of Means

G3

	Statistic[a]	df1	df2	Sig.
Welch	18.183	3	139.101	.000

a. Asymptotically F distributed.

```
602  0 M>
* ------------------------------------------------------------.
```

```
 603  0 M>  * ------------------------------------------------------------.
* 4. Manual SPSS F-Max table for G3 by studytime.
 604  0 M>  * 4. Manual SPSS F-Max table for G3 by studytime.
* SPSS AGGREGATE has SD(), not VARIANCE(); variance = SD ** 2.
 605  0 M>  * SPSS AGGREGATE has SD(), not VARIANCE(); variance = SD ** 2.
* ------------------------------------------------------------.
 606  0 M>  * ------------------------------------------------------------.

 607  0 M>
DATASET ACTIVATE HartleyData.
 608  0 M>  DATASET ACTIVATE HartleyData.
DATASET COPY HartleyMainG3.
 609  0 M>  DATASET COPY HartleyMainG3.
```

Dataset Copy

Warnings

Replacing existing dataset named HartleyMainG3.

```
DATASET ACTIVATE HartleyMainG3.
 610  0 M>  DATASET ACTIVATE HartleyMainG3.

 611  0 M>
AGGREGATE
 612  0 M>  AGGREGATE
 /OUTFILE=*
 613  0 M>   /OUTFILE=*
 /BREAK=studytime
 614  0 M>   /BREAK=studytime
 /group_n=N
 615  0 M>   /group_n=N
 /g3_mean=MEAN(G3)
 616  0 M>   /g3_mean=MEAN(G3)
 /g3_median=MEDIAN(G3)
 617  0 M>   /g3_median=MEDIAN(G3)
 /g3_sd=SD(G3)
 618  0 M>   /g3_sd=SD(G3)
 /g3_min=MIN(G3)
 619  0 M>   /g3_min=MIN(G3)
```

```
 /g3_max=MAX(G3).
 620  0 M>   /g3_max=MAX(G3).

 621  0 M>
COMPUTE g3_variance = g3_sd ** 2.
 622  0 M>  COMPUTE g3_variance = g3_sd ** 2.
EXECUTE.
 623  0 M>  EXECUTE.

 624  0 M>
AGGREGATE
 625  0 M>  AGGREGATE
 /OUTFILE=* MODE=ADDVARIABLES
 626  0 M>   /OUTFILE=* MODE=ADDVARIABLES
 /BREAK=
 627  0 M>   /BREAK=
 /max_variance=MAX(g3_variance)
 628  0 M>   /max_variance=MAX(g3_variance)
 /min_variance=MIN(g3_variance)
 629  0 M>   /min_variance=MIN(g3_variance)
 /min_group_n=MIN(group_n)
 630  0 M>   /min_group_n=MIN(group_n)
 /max_group_n=MAX(group_n).
 631  0 M>   /max_group_n=MAX(group_n).

 632  0 M>
COMPUTE hartley_fmax = max_variance / min_variance.
 633  0 M>  COMPUTE hartley_fmax = max_variance / min_variance.
COMPUTE balance_ratio = min_group_n / max_group_n.
 634  0 M>  COMPUTE balance_ratio = min_group_n / max_group_n.
FORMATS g3_mean g3_median g3_sd g3_variance g3_min g3_max max_variance min_var
iance hartley_fmax balance_ratio (F10.4).
 635  0 M>  FORMATS g3_mean g3_median g3_sd g3_variance g3_min g3_max max_vari
ance min_variance hartley_fmax balance_ratio (F10.4).
EXECUTE.
 636  0 M>  EXECUTE.

 637  0 M>
TITLE 'SPSS Hartley F-Max Table: G3 by Studytime'.
```

```
638  0 M>  TITLE 'SPSS Hartley F-Max Table: G3 by Studytime'.
```

```
 639  0 M>
SORT CASES BY studytime(A).
 640  0 M>  SORT CASES BY studytime(A).

 641  0 M>
LIST VARIABLES=studytime group_n g3_mean g3_sd g3_variance
 642  0 M>  LIST VARIABLES=studytime group_n g3_mean g3_sd g3_variance
 /CASES=FROM 1 TO 4.
 643  0 M>   /CASES=FROM 1 TO 4.
```

List

```
studytime group_n    g3_mean      g3_sd g3_variance

     1.00     212    10.8443     3.2186     10.3595
     2.00     305    12.0918     3.2431     10.5179
     3.00      97    13.2268     2.5021      6.2605
     4.00      35    13.0571     3.0384      9.2319


Number of cases read:  4    Number of cases listed:  4
```

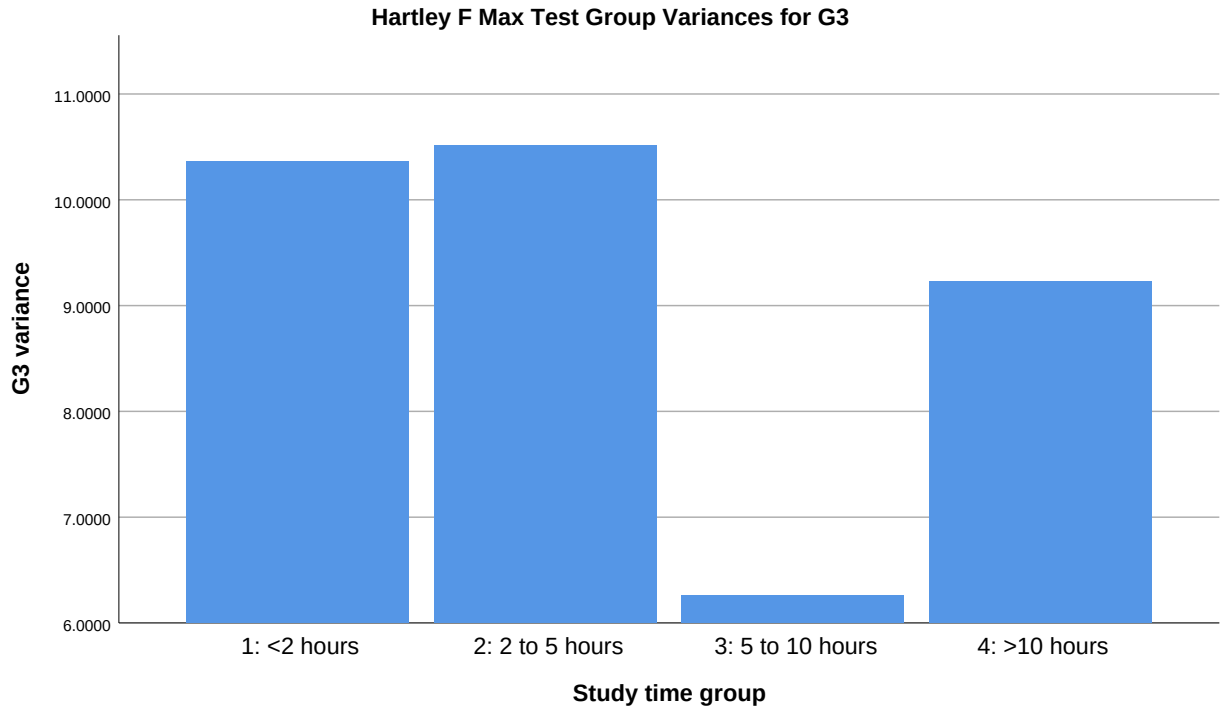
```
 644  0 M>
LIST VARIABLES=max_variance min_variance hartley_fmax balance_ratio
 645  0 M>  LIST VARIABLES=max_variance min_variance hartley_fmax balance_rati
o
 /CASES=FROM 1 TO 1.
 646  0 M>   /CASES=FROM 1 TO 1.
```

List

```
max_variance min_variance hartley_fmax balance_ratio

    10.5179       6.2605       1.6800         .1148


Number of cases read:  1    Number of cases listed:  1

 647  0 M>
SAVE TRANSLATE OUTFILE='D:\low kda score priority basis posts\first post\Hartl
ey F Max Test\SPSS\hartley_fmax_spss_main_g3_group_variances_v3.csv'
 648  0 M>  SAVE TRANSLATE OUTFILE='D:\low kda score priority basis posts\firs
t post\Hartley F Max Test\SPSS\hartley_fmax_spss_main_
               g3_group_variances_v3.csv'
 /TYPE=CSV
 649  0 M>   /TYPE=CSV
 /ENCODING='UTF8'
 650  0 M>   /ENCODING='UTF8'
 /REPLACE
 651  0 M>   /REPLACE
 /FIELDNAMES
 652  0 M>   /FIELDNAMES
 /CELLS=VALUES.
 653  0 M>   /CELLS=VALUES.



 654  0 M>
GGRAPH
 655  0 M>  GGRAPH
 /GRAPHDATASET NAME="variancebars" VARIABLES=studytime g3_variance
 656  0 M>   /GRAPHDATASET NAME="variancebars" VARIABLES=studytime g3_variance
 /GRAPHSPEC SOURCE=INLINE.
 657  0 M>   /GRAPHSPEC SOURCE=INLINE.
BEGIN GPL
 SOURCE: s=userSource(id("variancebars"))
 DATA: studytime=col(source(s), name("studytime"), unit.category())
 DATA: g3_variance=col(source(s), name("g3_variance"))
```

```
 GUIDE: axis(dim(1), label("Study time group"))
 GUIDE: axis(dim(2), label("G3 variance"))
 GUIDE: text.title(label("Hartley F Max Test Group Variances for G3"))
 ELEMENT: interval(position(studytime*g3_variance))
END GPL.
```

GGraph




```
 658  0 M>
* ------------------------------------------------------------.
 659  0 M>  * ------------------------------------------------------------.
* 5. G1, G2 and G3 comparison by studytime.
 660  0 M>  * 5. G1, G2 and G3 comparison by studytime.
* ------------------------------------------------------------.
 661  0 M>  * ------------------------------------------------------------.

 662  0 M>
DATASET ACTIVATE HartleyData.
 663  0 M>  DATASET ACTIVATE HartleyData.

 664  0 M>
```

```
TITLE 'G1 G2 G3 Variance Checks by Studytime'.
 665  0 M>  TITLE 'G1 G2 G3 Variance Checks by Studytime'.
```

```
 666  0 M>
MEANS TABLES=G1 G2 G3 BY studytime
 667  0 M>  MEANS TABLES=G1 G2 G3 BY studytime
 /CELLS=COUNT MEAN MEDIAN STDDEV VARIANCE MIN MAX SEMEAN.
 668  0 M>   /CELLS=COUNT MEAN MEDIAN STDDEV VARIANCE MIN MAX SEMEAN.
```

Means

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
G1 * studytime	649	100.0%	0	0.0%	649	100.0%
G2 * studytime	649	100.0%	0	0.0%	649	100.0%
G3 * studytime	649	100.0%	0	0.0%	649	100.0%

Report

studytime		G1	G2	G3
1.00	N	212	212	212
	Mean	10.5047	10.7028	10.8443
	Median	10.0000	11.0000	11.0000
	Std. Deviation	2.56572	2.69656	3.21862
	Variance	6.583	7.271	10.360
	Minimum	4.00	.00	.00
	Maximum	18.00	18.00	18.00
	Std. Error of Mean	.17621	.18520	.22106
2.00	N	305	305	305
	Mean	11.5377	11.6623	12.0918
	Median	12.0000	12.0000	12.0000
	Std. Deviation	2.73730	2.98252	3.24313
	Variance	7.493	8.895	10.518
	Minimum	.00	.00	.00
	Maximum	18.00	18.00	19.00
	Std. Error of Mean	.15674	.17078	.18570
3.00	N	97	97	97
	Mean	12.4227	12.7938	13.2268

G1 G2 G3 Variance Checks by Studytime

Report

studytime		G1	G2	G3
	Median	13.0000	13.0000	13.0000
	Std. Deviation	2.45728	2.46195	2.50210
	Variance	6.038	6.061	6.261
	Minimum	7.00	7.00	8.00
	Maximum	19.00	18.00	18.00
	Std. Error of Mean	.24950	.24997	.25405
4.00	N	35	35	35
	Mean	12.7714	12.6286	13.0571
	Median	13.0000	12.0000	13.0000
	Std. Deviation	2.94145	3.13506	3.03841
	Variance	8.652	9.829	9.232
	Minimum	5.00	6.00	6.00
	Maximum	18.00	19.00	19.00
	Std. Error of Mean	.49720	.52992	.51358
Total	N	649	649	649
	Mean	11.3991	11.5701	11.9060
	Median	11.0000	11.0000	12.0000
	Std. Deviation	2.74527	2.91364	3.23066
	Variance	7.536	8.489	10.437
	Minimum	.00	.00	.00
	Maximum	19.00	19.00	19.00
	Std. Error of Mean	.10776	.11437	.12681

```
 669  0 M>
ONEWAY G1 G2 G3 BY studytime
 670  0 M>  ONEWAY G1 G2 G3 BY studytime
 /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 671  0 M>   /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 /MISSING ANALYSIS.
 672  0 M>   /MISSING ANALYSIS.
```

Oneway

G1 G2 G3 Variance Checks by Studytime

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
G1	1.00	212	10.5047	2.56572	.17621	10.1574	10.8521
	2.00	305	11.5377	2.73730	.15674	11.2293	11.8461
	3.00	97	12.4227	2.45728	.24950	11.9274	12.9179
	4.00	35	12.7714	2.94145	.49720	11.7610	13.7819
	Total	649	11.3991	2.74527	.10776	11.1875	11.6107
G2	1.00	212	10.7028	2.69656	.18520	10.3377	11.0679
	2.00	305	11.6623	2.98252	.17078	11.3262	11.9984
	3.00	97	12.7938	2.46195	.24997	12.2976	13.2900
	4.00	35	12.6286	3.13506	.52992	11.5516	13.7055
	Total	649	11.5701	2.91364	.11437	11.3455	11.7947
G3	1.00	212	10.8443	3.21862	.22106	10.4086	11.2801
	2.00	305	12.0918	3.24313	.18570	11.7264	12.4572
	3.00	97	13.2268	2.50210	.25405	12.7225	13.7311
	4.00	35	13.0571	3.03841	.51358	12.0134	14.1009
	Total	649	11.9060	3.23066	.12681	11.6570	12.1550

G1 G2 G3 Variance Checks by Studytime

Descriptives

		Minimum	Maximum
G1	1.00	4.00	18.00
	2.00	.00	18.00
	3.00	7.00	19.00
	4.00	5.00	18.00
	Total	.00	19.00
G2	1.00	.00	18.00
	2.00	.00	18.00
	3.00	7.00	18.00
	4.00	6.00	19.00
	Total	.00	19.00
G3	1.00	.00	18.00
	2.00	.00	19.00
	3.00	8.00	18.00
	4.00	6.00	19.00
	Total	.00	19.00

G1 G2 G3 Variance Checks by Studytime

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
G1	Based on Mean	.542	3	645	.653
	Based on Median	.555	3	645	.645
	Based on Median and with adjusted df	.555	3	637.966	.645
	Based on trimmed mean	.547	3	645	.650
G2	Based on Mean	1.703	3	645	.165
	Based on Median	1.613	3	645	.185
	Based on Median and with adjusted df	1.613	3	626.977	.185
	Based on trimmed mean	1.688	3	645	.168
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

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
G1	Between Groups	342.986	3	114.329	16.240	.000
	Within Groups	4540.653	645	7.040		
	Total	4883.639	648			
G2	Between Groups	346.518	3	115.506	14.454	.000
	Within Groups	5154.542	645	7.992		
	Total	5501.060	648			
G3	Between Groups	465.078	3	155.026	15.876	.000
	Within Groups	6298.189	645	9.765		
	Total	6763.267	648			

Robust Tests of Equality of Means

		Statistic[a]	df1	df2	Sig.
G1	Welch	16.826	3	134.753	.000
G2	Welch	16.556	3	135.657	.000
G3	Welch	18.183	3	139.101	.000

a. Asymptotically F distributed.

```
 673  0 M>
DATASET COPY HartleyGradeLong.
 674  0 M>  DATASET COPY HartleyGradeLong.
```

Dataset Copy

Warnings

Replacing existing dataset named HartleyGradeLong.

```
DATASET ACTIVATE HartleyGradeLong.
 675  0 M>  DATASET ACTIVATE HartleyGradeLong.

 676  0 M>
VARSTOCASES
 677  0 M>  VARSTOCASES
 /MAKE grade FROM G1 G2 G3
 678  0 M>   /MAKE grade FROM G1 G2 G3
 /INDEX=grade_variable
 679  0 M>   /INDEX=grade_variable
 /KEEP=case_id studytime
 680  0 M>   /KEEP=case_id studytime
 /NULL=KEEP.
 681  0 M>   /NULL=KEEP.
```

Variables to Cases

```
[HartleyGradeLong]
```

Generated Variables

Name	Label
grade_variable	<none>
grade	First period grade

Processing Statistics

Variables In	36
Variables Out	4

```
 682  0 M>
VALUE LABELS grade_variable
 683  0 M>  VALUE LABELS grade_variable
 1 'G1'
 684  0 M>   1 'G1'
 2 'G2'
 685  0 M>   2 'G2'
 3 'G3'.
 686  0 M>   3 'G3'.

 687  0 M>
AGGREGATE
 688  0 M>  AGGREGATE
 /OUTFILE=*
 689  0 M>   /OUTFILE=*
 /BREAK=grade_variable studytime
 690  0 M>   /BREAK=grade_variable studytime
 /group_n=N
 691  0 M>   /group_n=N
 /grade_mean=MEAN(grade)
 692  0 M>   /grade_mean=MEAN(grade)
 /grade_sd=SD(grade)
 693  0 M>   /grade_sd=SD(grade)
 /grade_min=MIN(grade)
 694  0 M>   /grade_min=MIN(grade)
 /grade_max=MAX(grade).
```

```
 695  0 M>   /grade_max=MAX(grade).

 696  0 M>
COMPUTE grade_variance = grade_sd ** 2.
 697  0 M>  COMPUTE grade_variance = grade_sd ** 2.
EXECUTE.
 698  0 M>  EXECUTE.

 699  0 M>
AGGREGATE
 700  0 M>  AGGREGATE
 /OUTFILE=* MODE=ADDVARIABLES
 701  0 M>   /OUTFILE=* MODE=ADDVARIABLES
 /BREAK=grade_variable
 702  0 M>   /BREAK=grade_variable
 /max_grade_variance=MAX(grade_variance)
 703  0 M>   /max_grade_variance=MAX(grade_variance)
 /min_grade_variance=MIN(grade_variance)
 704  0 M>   /min_grade_variance=MIN(grade_variance)
 /min_grade_group_n=MIN(group_n)
 705  0 M>   /min_grade_group_n=MIN(group_n)
 /max_grade_group_n=MAX(group_n).
 706  0 M>   /max_grade_group_n=MAX(group_n).

 707  0 M>
COMPUTE grade_hartley_fmax = max_grade_variance / min_grade_variance.
 708  0 M>  COMPUTE grade_hartley_fmax = max_grade_variance / min_grade_varian
ce.
COMPUTE grade_balance_ratio = min_grade_group_n / max_grade_group_n.
 709  0 M>  COMPUTE grade_balance_ratio = min_grade_group_n / max_grade_group_
n.
FORMATS grade_mean grade_sd grade_variance max_grade_variance min_grade_varian
ce grade_hartley_fmax grade_balance_ratio (F10.4).
 710  0 M>  FORMATS grade_mean grade_sd grade_variance max_grade_variance min_
grade_variance grade_hartley_fmax grade_balance_ratio
              (F10.4).
EXECUTE.
 711  0 M>  EXECUTE.
```

```
 712  0 M>
TITLE 'SPSS Hartley F-Max Table: G1 G2 G3'.
 713  0 M>  TITLE 'SPSS Hartley F-Max Table: G1 G2 G3'.
```

```
 714  0 M>
SORT CASES BY grade_variable(A) studytime(A).
 715  0 M>  SORT CASES BY grade_variable(A) studytime(A).

 716  0 M>
LIST VARIABLES=grade_variable studytime group_n grade_mean grade_sd grade_vari
ance
 717  0 M>  LIST VARIABLES=grade_variable studytime group_n grade_mean grade_s
d grade_variance
 /CASES=FROM 1 TO 12.
 718  0 M>   /CASES=FROM 1 TO 12.
```

List

grade_variable	studytime	group_n	grade_mean	grade_sd	grade_variance
1	1.00	212	10.5047	2.5657	6.5829
1	2.00	305	11.5377	2.7373	7.4928
1	3.00	97	12.4227	2.4573	6.0382
1	4.00	35	12.7714	2.9414	8.6521
2	1.00	212	10.7028	2.6966	7.2715
2	2.00	305	11.6623	2.9825	8.8954
2	3.00	97	12.7938	2.4620	6.0612
2	4.00	35	12.6286	3.1351	9.8286
3	1.00	212	10.8443	3.2186	10.3595
3	2.00	305	12.0918	3.2431	10.5179
3	3.00	97	13.2268	2.5021	6.2605
3	4.00	35	13.0571	3.0384	9.2319

```
Number of cases read:  12    Number of cases listed:  12

 719  0 M>
LIST VARIABLES=grade_variable max_grade_variance min_grade_variance grade_hart
ley_fmax grade_balance_ratio
 720  0 M>  LIST VARIABLES=grade_variable max_grade_variance min_grade_varianc
e grade_hartley_fmax grade_balance_ratio
 /CASES=FROM 1 TO 12.
 721  0 M>   /CASES=FROM 1 TO 12.
```

List

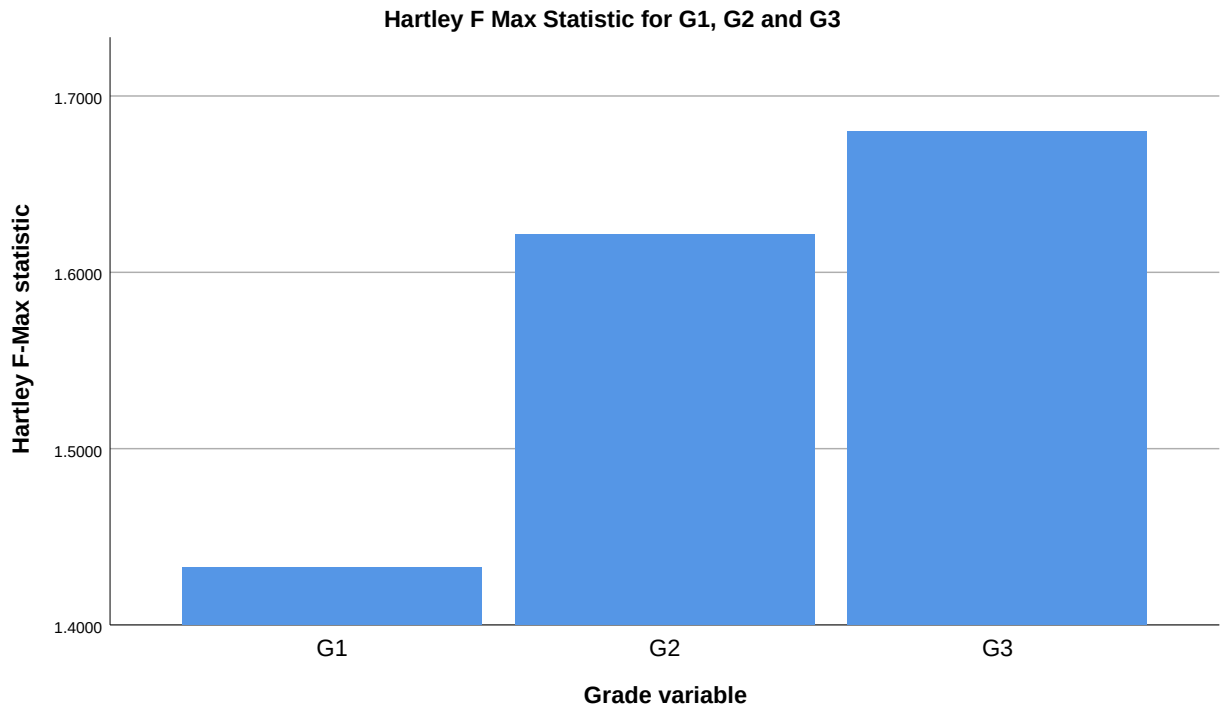
SPSS Hartley F-Max Table: G1 G2 G3

```
grade_variable max_grade_variance min_grade_variance grade_hartley_fmax grade_
balance_ratio

        1              8.6521             6.0382             1.4329
    .1148
        1              8.6521             6.0382             1.4329
    .1148
        1              8.6521             6.0382             1.4329
    .1148
        1              8.6521             6.0382             1.4329
    .1148
        2              9.8286             6.0612             1.6216
    .1148
        2              9.8286             6.0612             1.6216
    .1148
        2              9.8286             6.0612             1.6216
    .1148
        2              9.8286             6.0612             1.6216
    .1148
        3             10.5179             6.2605             1.6800
    .1148
        3             10.5179             6.2605             1.6800
    .1148
        3             10.5179             6.2605             1.6800
    .1148
        3             10.5179             6.2605             1.6800
    .1148


Number of cases read:  12    Number of cases listed:  12

 722  0 M>
SAVE TRANSLATE OUTFILE='D:\low kda score priority basis posts\first post\Hartl
ey F Max Test\SPSS\hartley_fmax_spss_g1_g2_g3_group_variances_v3.csv'
 723  0 M>  SAVE TRANSLATE OUTFILE='D:\low kda score priority basis posts\firs
t post\Hartley F Max Test\SPSS\hartley_fmax_spss_g1_g2
              _g3_group_variances_v3.csv'
```

```
 /TYPE=CSV
 724  0 M>   /TYPE=CSV
 /ENCODING='UTF8'
 725  0 M>   /ENCODING='UTF8'
 /REPLACE
 726  0 M>   /REPLACE
 /FIELDNAMES
 727  0 M>   /FIELDNAMES
 /CELLS=VALUES.
 728  0 M>   /CELLS=VALUES.



 729  0 M>
GGRAPH
 730  0 M>  GGRAPH
 /GRAPHDATASET NAME="gradefmax" VARIABLES=grade_variable grade_hartley_fmax
 731  0 M>   /GRAPHDATASET NAME="gradefmax" VARIABLES=grade_variable grade_har
tley_fmax
 /GRAPHSPEC SOURCE=INLINE.
 732  0 M>   /GRAPHSPEC SOURCE=INLINE.
BEGIN GPL
 SOURCE: s=userSource(id("gradefmax"))
 DATA: grade_variable=col(source(s), name("grade_variable"), unit.category())
 DATA: grade_hartley_fmax=col(source(s), name("grade_hartley_fmax"))
 GUIDE: axis(dim(1), label("Grade variable"))
 GUIDE: axis(dim(2), label("Hartley F-Max statistic"))
 GUIDE: text.title(label("Hartley F Max Statistic for G1, G2 and G3"))
 ELEMENT: interval(position(grade_variable*grade_hartley_fmax))
END GPL.
```

GGraph

SPSS Hartley F-Max Table: G1 G2 G3




```
 733  0 M>
* ------------------------------------------------------------.
 734  0 M>  * ------------------------------------------------------------.
* 6. Broader SPSS homogeneity checks for article discussion.
 735  0 M>  * 6. Broader SPSS homogeneity checks for article discussion.
* ------------------------------------------------------------.
 736  0 M>  * ------------------------------------------------------------.

 737  0 M>
DATASET ACTIVATE HartleyData.
 738  0 M>  DATASET ACTIVATE HartleyData.

 739  0 M>
TITLE 'Numeric Homogeneity Checks'.
 740  0 M>  TITLE 'Numeric Homogeneity Checks'.
```

```
 741  0 M>
ONEWAY G3 BY studytime
 742  0 M>  ONEWAY G3 BY studytime
 /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 743  0 M>   /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 /MISSING ANALYSIS.
 744  0 M>   /MISSING ANALYSIS.
```

Oneway

[HartleyData] D:\low kda score priority basis posts\first post\Hartley F Max Test\SPSS\student_por_hartley_fmax_clean_spss_v3.sav

Descriptives

G3

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum
					Lower Bound	Upper Bound	
1.00	212	10.8443	3.21862	.22106	10.4086	11.2801	.00
2.00	305	12.0918	3.24313	.18570	11.7264	12.4572	.00
3.00	97	13.2268	2.50210	.25405	12.7225	13.7311	8.00
4.00	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

G3

	Maximum
1.00	18.00
2.00	19.00
3.00	18.00
4.00	19.00
Total	19.00

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

ANOVA

G3

	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			

Robust Tests of Equality of Means

G3

	Statistic[a]	df1	df2	Sig.
Welch	18.183	3	139.101	.000

a. Asymptotically F distributed.

```
 745  0 M>
ONEWAY G3 BY traveltime
 746  0 M>  ONEWAY G3 BY traveltime
 /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 747  0 M>   /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 /MISSING ANALYSIS.
 748  0 M>   /MISSING ANALYSIS.
```

Oneway

Numeric Homogeneity Checks

Descriptives

G3

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum
					Lower Bound	Upper Bound	
1.00	366	12.2514	3.11377	.16276	11.9313	12.5714	.00
2.00	213	11.5775	3.42299	.23454	11.1151	12.0398	.00
3.00	54	11.1667	3.27224	.44530	10.2735	12.0598	.00
4.00	16	10.8750	1.99583	.49896	9.8115	11.9385	8.00
Total	649	11.9060	3.23066	.12681	11.6570	12.1550	.00

Descriptives

G3

	Maximum
1.00	19.00
2.00	19.00
3.00	18.00
4.00	16.00
Total	19.00

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
G3	Based on Mean	1.247	3	645	.292
	Based on Median	1.172	3	645	.320
	Based on Median and with adjusted df	1.172	3	618.043	.320
	Based on trimmed mean	1.220	3	645	.301

ANOVA

G3

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	113.170	3	37.723	3.659	.012
Within Groups	6650.096	645	10.310		
Total	6763.267	648			

Robust Tests of Equality of Means

G3

	Statistic[a]	df1	df2	Sig.
Welch	4.403	3	64.382	.007

a. Asymptotically F distributed.

```
 749  0 M>
ONEWAY G3 BY Medu
 750  0 M>  ONEWAY G3 BY Medu
 /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 751  0 M>   /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 /MISSING ANALYSIS.
 752  0 M>   /MISSING ANALYSIS.
```

Oneway

Descriptives

G3

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum
					Lower Bound	Upper Bound	
.00	6	11.6667	1.75119	.71492	9.8289	13.5044	10.00
1.00	143	10.7972	3.16352	.26455	10.2742	11.3202	.00
2.00	186	11.6613	3.06123	.22446	11.2185	12.1041	.00
3.00	139	11.9209	3.12323	.26491	11.3971	12.4447	.00
4.00	175	13.0686	3.23698	.24469	12.5856	13.5515	.00
Total	649	11.9060	3.23066	.12681	11.6570	12.1550	.00

Descriptives

G3

	Maximum
.00	15.00
1.00	18.00
2.00	18.00
3.00	19.00
4.00	19.00
Total	19.00

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
G3	Based on Mean	.674	4	644	.610
	Based on Median	.846	4	644	.496
	Based on Median and with adjusted df	.846	4	635.233	.496
	Based on trimmed mean	.726	4	644	.574

ANOVA

G3

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	423.846	4	105.962	10.764	.000
Within Groups	6339.420	644	9.844		
Total	6763.267	648			

Robust Tests of Equality of Means

G3

	Statistic[a]	df1	df2	Sig.
Welch	9.852	4	39.356	.000

a. Asymptotically F distributed.

753 0 M>

```
ONEWAY G3 BY Fedu
 754  0 M>  ONEWAY G3 BY Fedu
 /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 755  0 M>   /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 /MISSING ANALYSIS.
 756  0 M>   /MISSING ANALYSIS.
```

Oneway

Descriptives

G3

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum
					Lower Bound	Upper Bound	
.00	7	12.1429	2.79455	1.05624	9.5583	14.7274	10.00
1.00	174	10.9368	3.42408	.25958	10.4244	11.4491	.00
2.00	209	11.7847	3.44832	.23853	11.3145	12.2549	.00
3.00	131	12.3817	2.49139	.21767	11.9510	12.8123	1.00
4.00	128	12.9219	2.91510	.25766	12.4120	13.4317	.00
Total	649	11.9060	3.23066	.12681	11.6570	12.1550	.00

Descriptives

G3

	Maximum
.00	18.00
1.00	19.00
2.00	18.00
3.00	18.00
4.00	19.00
Total	19.00

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
G3	Based on Mean	1.571	4	644	.180
	Based on Median	1.645	4	644	.161
	Based on Median and with adjusted df	1.645	4	591.759	.161
	Based on trimmed mean	1.640	4	644	.163

ANOVA

G3

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	328.659	4	82.165	8.223	.000
Within Groups	6434.608	644	9.992		
Total	6763.267	648			

Robust Tests of Equality of Means

G3

	Statistic[a]	df1	df2	Sig.
Welch	7.995	4	45.144	.000

a. Asymptotically F distributed.

```
 757  0 M>
ONEWAY G3 BY health
 758  0 M>  ONEWAY G3 BY health
 /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 759  0 M>   /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 /MISSING ANALYSIS.
 760  0 M>   /MISSING ANALYSIS.
```

Oneway

Numeric Homogeneity Checks

Descriptives

G3

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum
					Lower Bound	Upper Bound	
1.00	90	12.4778	3.26448	.34411	11.7940	13.1615	.00
2.00	78	12.1923	3.29918	.37356	11.4485	12.9362	.00
3.00	124	11.8387	3.13747	.28175	11.2810	12.3964	.00
4.00	108	12.3056	2.99675	.28836	11.7339	12.8772	.00
5.00	249	11.4699	3.30202	.20926	11.0577	11.8820	.00
Total	649	11.9060	3.23066	.12681	11.6570	12.1550	.00

Descriptives

G3

	Maximum
1.00	18.00
2.00	19.00
3.00	19.00
4.00	18.00
5.00	18.00
Total	19.00

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
G3	Based on Mean	.726	4	644	.574
	Based on Median	.525	4	644	.718
	Based on Median and with adjusted df	.525	4	635.073	.718
	Based on trimmed mean	.708	4	644	.587

ANOVA

G3

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	100.981	4	25.245	2.440	.046
Within Groups	6662.286	644	10.345		
Total	6763.267	648			

Robust Tests of Equality of Means

G3

	Statistic[a]	df1	df2	Sig.
Welch	2.395	4	253.155	.051

a. Asymptotically F distributed.

```
 761  0 M>
ONEWAY G3 BY failures
 762  0 M>  ONEWAY G3 BY failures
 /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 763  0 M>   /STATISTICS DESCRIPTIVES HOMOGENEITY WELCH
 /MISSING ANALYSIS.
 764  0 M>   /MISSING ANALYSIS.
```

Oneway

Descriptives

G3

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum
					Lower Bound	Upper Bound	
.00	549	12.5100	2.82881	.12073	12.2729	12.7472	.00
1.00	70	8.6429	3.44327	.41155	7.8218	9.4639	.00
2.00	16	8.8125	3.20871	.80218	7.1027	10.5223	.00
3.00	14	8.0714	2.78635	.74468	6.4626	9.6802	.00
Total	649	11.9060	3.23066	.12681	11.6570	12.1550	.00

Numeric Homogeneity Checks

Descriptives

G3

	Maximum
.00	19.00
1.00	16.00
2.00	15.00
3.00	11.00
Total	19.00

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
G3	Based on Mean	.351	3	645	.788
	Based on Median	.177	3	645	.912
	Based on Median and with adjusted df	.177	3	548.946	.912
	Based on trimmed mean	.251	3	645	.861

ANOVA

G3

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1304.634	3	434.878	51.386	.000
Within Groups	5458.632	645	8.463		
Total	6763.267	648			

Robust Tests of Equality of Means

G3

	Statistic[a]	df1	df2	Sig.
Welch	40.989	3	33.369	.000

a. Asymptotically F distributed.

```
 765  0 M>
TITLE 'Categorical Homogeneity Checks'.
```

```
766  0 M>  TITLE 'Categorical Homogeneity Checks'.
```

```
 767  0 M>
GLM G3 BY school
 768  0 M>  GLM G3 BY school
 /PRINT=DESCRIPTIVE HOMOGENEITY
 769  0 M>   /PRINT=DESCRIPTIVE HOMOGENEITY
 /DESIGN=school.
 770  0 M>   /DESIGN=school.
```

General Linear Model

Between-Subjects Factors

		N
school	GP	423
	MS	226

Descriptive Statistics

Dependent Variable: G3

school	Mean	Std. Deviation	N
GP	12.5768	2.62564	423
MS	10.6504	3.83399	226
Total	11.9060	3.23066	649

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
G3	Based on Mean	13.232	1	647	.000
	Based on Median	12.706	1	647	.000
	Based on Median and with adjusted df	12.706	1	510.638	.000
	Based on trimmed mean	13.109	1	647	.000

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: G3

b. Design: Intercept + school

Tests of Between-Subjects Effects

Dependent Variable: G3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	546.629[a]	1	546.629	56.891	.000
Intercept	79469.525	1	79469.525	8270.834	.000
school	546.629	1	546.629	56.891	.000
Error	6216.638	647	9.608		
Total	98761.000	649			
Corrected Total	6763.267	648			

a. R Squared = .081 (Adjusted R Squared = .079)

```
 771  0 M>
GLM G3 BY address
 772  0 M>  GLM G3 BY address
 /PRINT=DESCRIPTIVE HOMOGENEITY
 773  0 M>   /PRINT=DESCRIPTIVE HOMOGENEITY
 /DESIGN=address.
 774  0 M>   /DESIGN=address.
```

General Linear Model

Between-Subjects Factors

		N
address	R	197
	U	452

Descriptive Statistics

Dependent Variable: G3

address	Mean	Std. Deviation	N
R	11.0863	3.60522	197
U	12.2633	2.98766	452
Total	11.9060	3.23066	649

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
G3	Based on Mean	.796	1	647	.373
	Based on Median	.724	1	647	.395
	Based on Median and with adjusted df	.724	1	587.961	.395
	Based on trimmed mean	1.295	1	647	.256

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: G3

b. Design: Intercept + address

Tests of Between-Subjects Effects

Dependent Variable: G3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	190.063[a]	1	190.063	18.708	.000
Intercept	74802.772	1	74802.772	7362.832	.000
address	190.063	1	190.063	18.708	.000
Error	6573.203	647	10.160		
Total	98761.000	649			
Corrected Total	6763.267	648			

a. R Squared = .028 (Adjusted R Squared = .027)

```
 775  0 M>
GLM G3 BY sex
 776  0 M>  GLM G3 BY sex
 /PRINT=DESCRIPTIVE HOMOGENEITY
 777  0 M>   /PRINT=DESCRIPTIVE HOMOGENEITY
 /DESIGN=sex.
 778  0 M>   /DESIGN=sex.
```

General Linear Model

Between-Subjects Factors

		N
sex	F	383
	M	266

Descriptive Statistics

Dependent Variable: G3

sex	Mean	Std. Deviation	N
F	12.2533	3.12415	383
M	11.4060	3.32069	266
Total	11.9060	3.23066	649

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
G3	Based on Mean	.004	1	647	.950
	Based on Median	.007	1	647	.933
	Based on Median and with adjusted df	.007	1	633.314	.933
	Based on trimmed mean	.018	1	647	.895

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: G3

b. Design: Intercept + sex

Tests of Between-Subjects Effects

Dependent Variable: G3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	112.683[a]	1	112.683	10.962	.001
Intercept	87869.613	1	87869.613	8548.368	.000
sex	112.683	1	112.683	10.962	.001
Error	6650.584	647	10.279		
Total	98761.000	649			
Corrected Total	6763.267	648			

a. R Squared = .017 (Adjusted R Squared = .015)

```
 779  0 M>
GLM G3 BY internet
 780  0 M>  GLM G3 BY internet
 /PRINT=DESCRIPTIVE HOMOGENEITY
 781  0 M>   /PRINT=DESCRIPTIVE HOMOGENEITY
 /DESIGN=internet.
 782  0 M>   /DESIGN=internet.
```

General Linear Model

Between-Subjects Factors

		N
internet	no	151
	yes	498

Descriptive Statistics

Dependent Variable: G3

internet	Mean	Std. Deviation	N
no	11.0265	3.44664	151
yes	12.1727	3.11715	498
Total	11.9060	3.23066	649

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
G3	Based on Mean	.116	1	647	.734
	Based on Median	.091	1	647	.763
	Based on Median and with adjusted df	.091	1	618.377	.763
	Based on trimmed mean	.026	1	647	.872

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: G3

b. Design: Intercept + internet

Tests of Between-Subjects Effects

Dependent Variable: G3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	152.224[a]	1	152.224	14.898	.000
Intercept	62360.113	1	62360.113	6102.970	.000
internet	152.224	1	152.224	14.898	.000
Error	6611.043	647	10.218		
Total	98761.000	649			
Corrected Total	6763.267	648			

a. R Squared = .023 (Adjusted R Squared = .021)

```
 783  0 M>
GLM G3 BY higher
 784  0 M>  GLM G3 BY higher
 /PRINT=DESCRIPTIVE HOMOGENEITY
 785  0 M>   /PRINT=DESCRIPTIVE HOMOGENEITY
 /DESIGN=higher.
 786  0 M>   /DESIGN=higher.
```

General Linear Model

Between-Subjects Factors

		N
higher	no	69
	yes	580

Descriptive Statistics

Dependent Variable: G3

higher	Mean	Std. Deviation	N
no	8.7971	2.97331	69
yes	12.2759	3.05840	580
Total	11.9060	3.23066	649

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
G3	Based on Mean	1.099	1	647	.295
	Based on Median	1.868	1	647	.172
	Based on Median and with adjusted df	1.868	1	629.821	.172
	Based on trimmed mean	1.804	1	647	.180

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: G3

b. Design: Intercept + higher

Tests of Between-Subjects Effects

Dependent Variable: G3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	746.245[a]	1	746.245	80.242	.000
Intercept	27383.163	1	27383.163	2944.465	.000
higher	746.245	1	746.245	80.242	.000
Error	6017.021	647	9.300		
Total	98761.000	649			
Corrected Total	6763.267	648			

a. R Squared = .110 (Adjusted R Squared = .109)

```
 787  0 M>
GLM G3 BY romantic
 788  0 M>  GLM G3 BY romantic
 /PRINT=DESCRIPTIVE HOMOGENEITY
 789  0 M>   /PRINT=DESCRIPTIVE HOMOGENEITY
 /DESIGN=romantic.
 790  0 M>   /DESIGN=romantic.
```

General Linear Model

Between-Subjects Factors

		N
romantic	no	410
	yes	239

Descriptive Statistics

Dependent Variable: G3

romantic	Mean	Std. Deviation	N
no	12.1293	3.00373	410
yes	11.5230	3.56077	239
Total	11.9060	3.23066	649

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
G3	Based on Mean	3.868	1	647	.050
	Based on Median	3.935	1	647	.048
	Based on Median and with adjusted df	3.935	1	616.544	.048
	Based on trimmed mean	3.596	1	647	.058

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: G3

b. Design: Intercept + romantic

Tests of Between-Subjects Effects

Dependent Variable: G3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	55.494[a]	1	55.494	5.353	.021
Intercept	84466.231	1	84466.231	8147.213	.000
romantic	55.494	1	55.494	5.353	.021
Error	6707.772	647	10.367		
Total	98761.000	649			
Corrected Total	6763.267	648			

a. R Squared = .008 (Adjusted R Squared = .007)

```
 791  0 M>
* ------------------------------------------------------------.
 792  0 M>  * ------------------------------------------------------------.
* 7. Extra article-friendly visuals from SPSS.
 793  0 M>  * 7. Extra article-friendly visuals from SPSS.
* ------------------------------------------------------------.
 794  0 M>  * ------------------------------------------------------------.

 795  0 M>
DATASET ACTIVATE HartleyData.
 796  0 M>  DATASET ACTIVATE HartleyData.
```

```
 797  0 M>
TITLE 'G3 Boxplot by Study Time'.
 798  0 M>  TITLE 'G3 Boxplot by Study Time'.
```

```
 799  0 M>
EXAMINE VARIABLES=G3 BY studytime
 800  0 M>  EXAMINE VARIABLES=G3 BY studytime
 /PLOT BOXPLOT
 801  0 M>   /PLOT BOXPLOT
 /STATISTICS NONE
 802  0 M>   /STATISTICS NONE
 /MISSING LISTWISE
 803  0 M>   /MISSING LISTWISE
 /NOTOTAL.
 804  0 M>   /NOTOTAL.
```

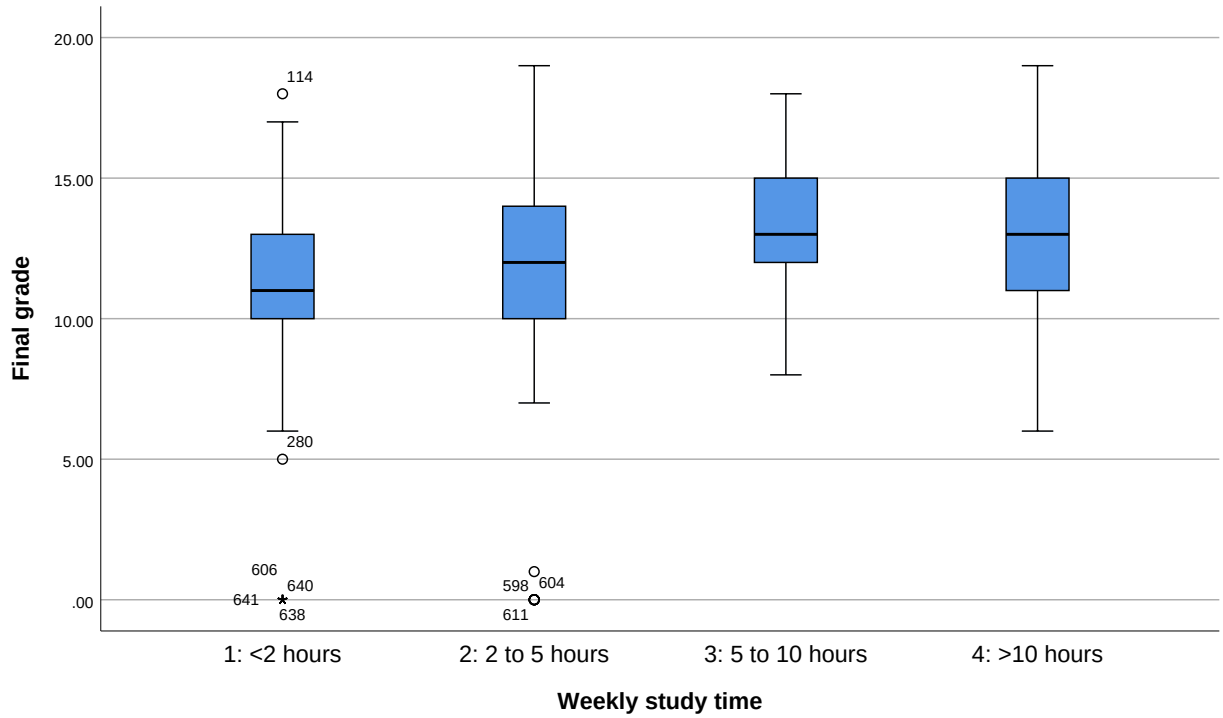
Explore

Weekly study time

Case Processing Summary

		Cases					
		Valid		Missing		Total	
	studytime	N	Percent	N	Percent	N	Percent
G3	1.00	212	100.0%	0	0.0%	212	100.0%
	2.00	305	100.0%	0	0.0%	305	100.0%
	3.00	97	100.0%	0	0.0%	97	100.0%
	4.00	35	100.0%	0	0.0%	35	100.0%

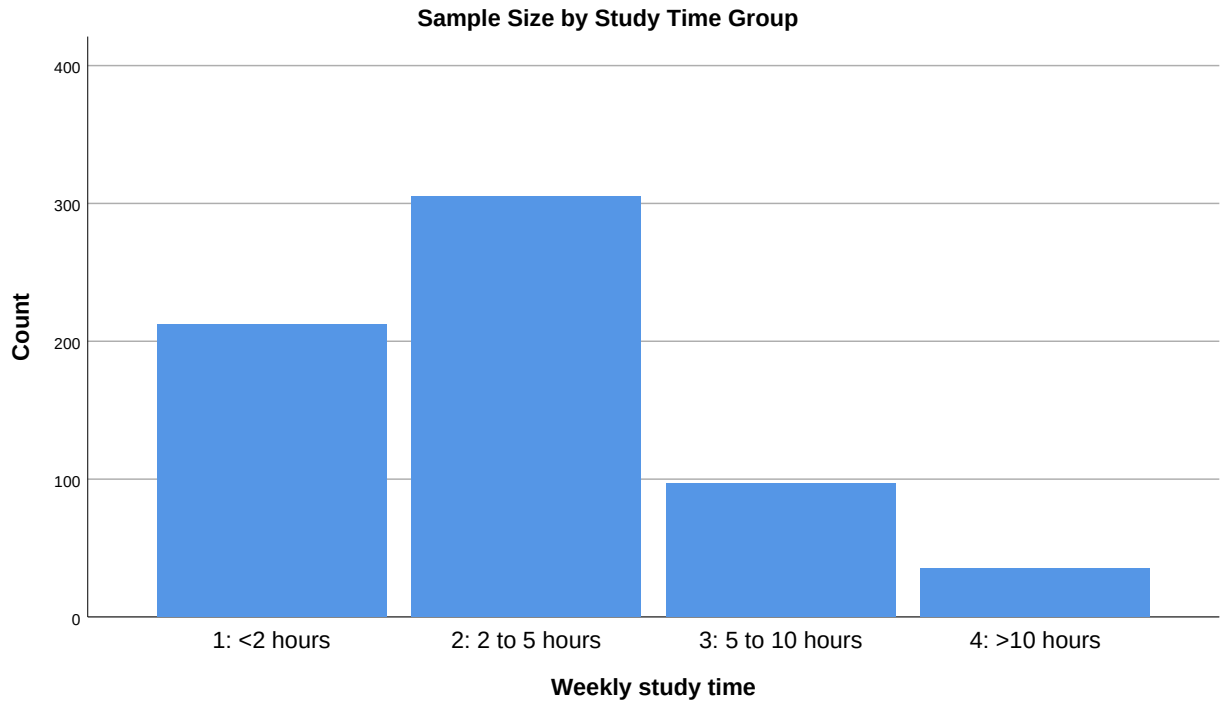
Final grade




```
 805  0 M>
TITLE 'Sample Size by Study Time Group'.
 806  0 M>  TITLE 'Sample Size by Study Time Group'.
```

```
 807  0 M>
GRAPH
 808  0 M>  GRAPH
 /BAR(SIMPLE)=COUNT BY studytime
 809  0 M>   /BAR(SIMPLE)=COUNT BY studytime
 /TITLE='Sample Size by Study Time Group'.
 810  0 M>   /TITLE='Sample Size by Study Time Group'.
```

Graph




```
 811  0 M>
* ------------------------------------------------------------.
 812  0 M>  * ------------------------------------------------------------.
* 8. Export SPSS output to PDF.
 813  0 M>  * 8. Export SPSS output to PDF.
* ------------------------------------------------------------.
 814  0 M>  * ------------------------------------------------------------.

 815  0 M>
OUTPUT EXPORT
 816  0 M>  OUTPUT EXPORT
```

```
/CONTENTS EXPORT=VISIBLE
817  0 M>   /CONTENTS EXPORT=VISIBLE
```