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ANCOVA

ANCOVA
Import data

ANCOVA descriptives

ANCOVA descriptives
 Dependent variable G3, covariate G2, factor school

Means

[ANCOVAData] D:\DATA ANALYSIS\E ANOVA Family\ANCOVA\SPSS_Output\sav\ANCOVA-dat
 a.sav

Case Processing Summary

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

Report

school_code		G2	G3
1	N	423	423
	Mean	12.14	12.58
	Std. Deviation	2.452	2.626
	Minimum	6	0
	Maximum	19	19
2	N	226	226
	Mean	10.50	10.65
	Std. Deviation	3.376	3.834
	Minimum	0	0
	Maximum	18	19
Total	N	649	649
	Mean	11.57	11.91
	Std. Deviation	2.914	3.231
	Minimum	0	0
	Maximum	19	19

ANCOVA correlation

ANCOVA correlation
Relationship between covariate G2 and dependent variable G3

Correlations

		G2	G3
G2	Pearson Correlation	1	.919**
	Sig. (2-tailed)		.000
	N	649	649
G3	Pearson Correlation	.919**	1
	Sig. (2-tailed)	.000	
	N	649	649

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

ANCOVA model

ANCOVA model
G3 by school after adjusting for G2

General Linear Model

Between-Subjects Factors

		Value Label	N
school_code	1	GP	423
	2	MS	226

Descriptive Statistics

Dependent Variable: G3

school_code	Mean	Std. Deviation	N
1	12.58	2.626	423
2	10.65	3.834	226
Total	11.91	3.231	649

Levene's Test of Equality of Error Variances^a

Dependent Variable: G3

F	df1	df2	Sig.
4.538	1	647	.034

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

a. Design: Intercept + G2 + school_code

ANCOVA model
G3 by school after adjusting for G2

Tests of Between-Subjects Effects

Dependent Variable: G3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	5716.087 ^a	2	2858.044	1763.114	.000	.845
Intercept	1.767	1	1.767	1.090	.297	.002
G2	5169.459	1	5169.459	3189.015	.000	.832
school_code	9.713	1	9.713	5.992	.015	.009
Error	1047.179	646	1.621			
Total	98761.000	649				
Corrected Total	6763.267	648				

a. R Squared = .845 (Adjusted R Squared = .845)

Parameter Estimates

Dependent Variable: G3

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	.084	.205	.411	.681	-.319	.488
G2	1.007	.018	56.471	.000	.972	1.042
[school_code=1]	.267	.109	2.448	.015	.053	.481
[school_code=2]	0 ^a

Parameter Estimates

Dependent Variable: G3

Parameter	Partial Eta Squared
Intercept	.000
G2	.832
[school_code=1]	.009
[school_code=2]	.

a. This parameter is set to zero because it is redundant.

ANCOVA adjusted means

ANCOVA adjusted means
Estimated marginal means of school adjusted at mean G2

General Linear Model

Between-Subjects Factors

		Value Label	N
school_code	1	GP	423
	2	MS	226

Descriptive Statistics

Dependent Variable: G3

school_code	Mean	Std. Deviation	N
1	12.58	2.626	423
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Total	11.91	3.231	649

Tests of Between-Subjects Effects

Dependent Variable: G3

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ANCOVA adjusted means
Estimated marginal means of school adjusted at mean G2

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[school_code=2]	0 ^a

Parameter Estimates

Dependent Variable: G3

Parameter	Partial Eta Squared
Intercept	.000
G2	.832
[school_code=1]	.009
[school_code=2]	.

a. This parameter is set to zero because it is redundant.

Estimated Marginal Means

School group numeric factor for ANCOVA

Estimates

Dependent Variable: G3

School group numeric factor for ANCOVA	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	11.999 ^a	.063	11.876	12.122
2	11.732 ^a	.087	11.562	11.903

a. Covariates appearing in the model are evaluated at the following values: G2 = 11.57.

ANCOVA adjusted means
Estimated marginal means of school adjusted at mean G2

Pairwise Comparisons

Dependent Variable: G3

(I) School group numeric factor for ANCOVA	(J) School group numeric factor for ANCOVA	Mean Difference (I-J)	Std. Error	Sig. ^b
1	2	.267*	.109	.015
2	1	-.267*	.109	.015

Pairwise Comparisons

Dependent Variable: G3

(I) School group numeric factor for ANCOVA	(J) School group numeric factor for ANCOVA	95% Confidence Interval for Difference ^b	
		Lower Bound	Upper Bound
1	2	.053	.481
2	1	-.481	-.053

Based on estimated marginal means

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

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: G3

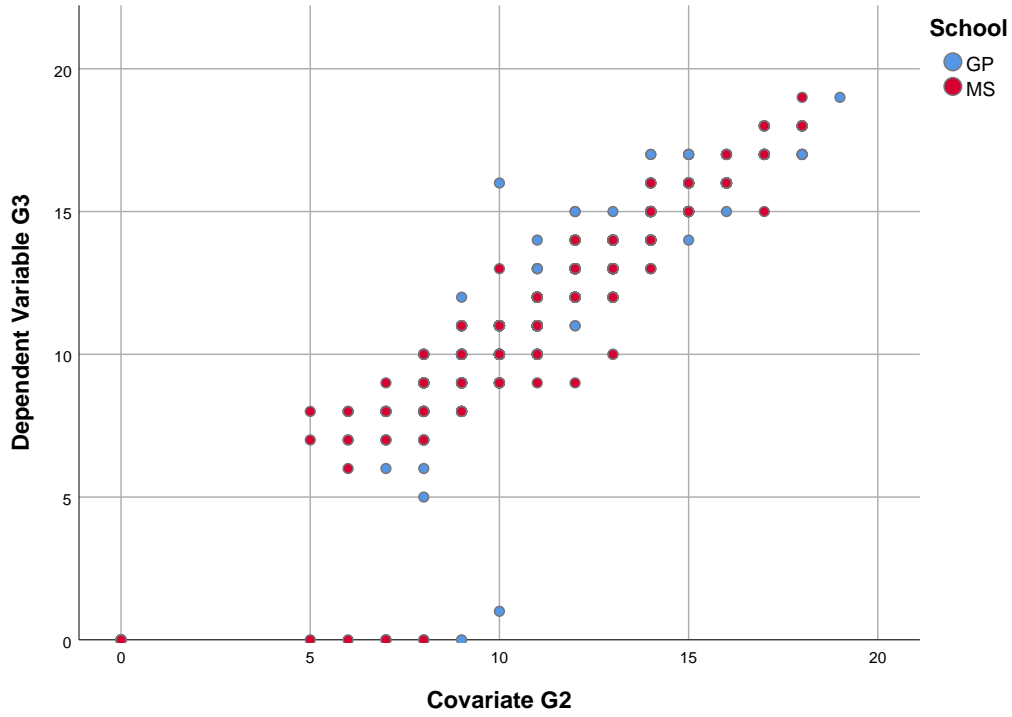
	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	9.713	1	9.713	5.992	.015	.009
Error	1047.179	646	1.621			

The F tests the effect of School group numeric factor for ANCOVA. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

ANCOVA scatterplot

ANCOVA scatterplot
G2 and G3 by school

GGraph



ANCOVA residual diagnostics

ANCOVA residual diagnostics
Save predicted values and residuals

General Linear Model

Between-Subjects Factors

		Value Label	N
school_code	1	GP	423
	2	MS	226

Tests of Between-Subjects Effects

Dependent Variable: G3

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5716.087 ^a	2	2858.044	1763.114	.000
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G2	5169.459	1	5169.459	3189.015	.000
school_code	9.713	1	9.713	5.992	.015
Error	1047.179	646	1.621		
Total	98761.000	649			
Corrected Total	6763.267	648			

a. R Squared = .845 (Adjusted R Squared = .845)

ANCOVA residual normality

ANCOVA residual normality
Residual output after ANCOVA model

Explore

Case Processing Summary

	Valid		Cases Missing		Total	
	N	Percent	N	Percent	N	Percent
RES_1	649	100.0%	0	0.0%	649	100.0%

Descriptives

		Statistic	Std. Error
RES_1	Mean	.0000	.04990
	95% Confidence Interval for Mean	Lower Bound Upper Bound	
		-.0980 .0980	
	5% Trimmed Mean	.0745	
	Median	-.1515	
	Variance	1.616	
	Std. Deviation	1.27123	
	Minimum	-9.42	
	Maximum	5.58	
	Range	15.00	
	Interquartile Range	1.03	
	Skewness	-2.940	.096
	Kurtosis	18.978	.192

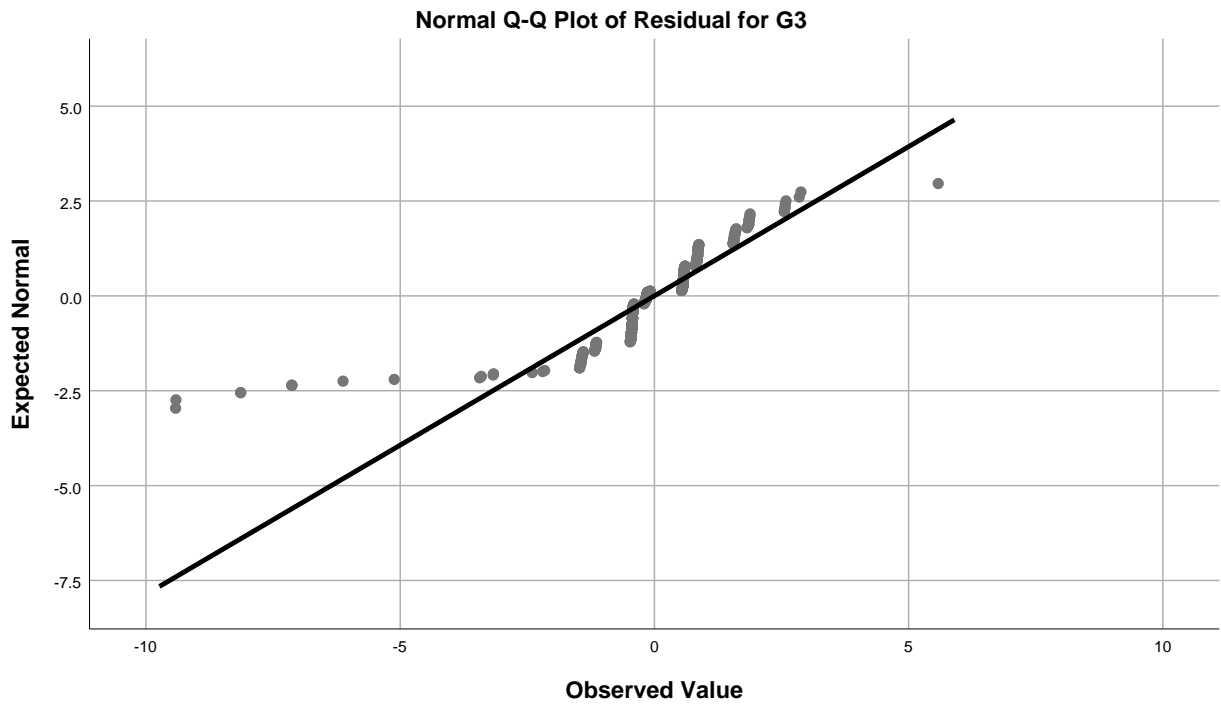
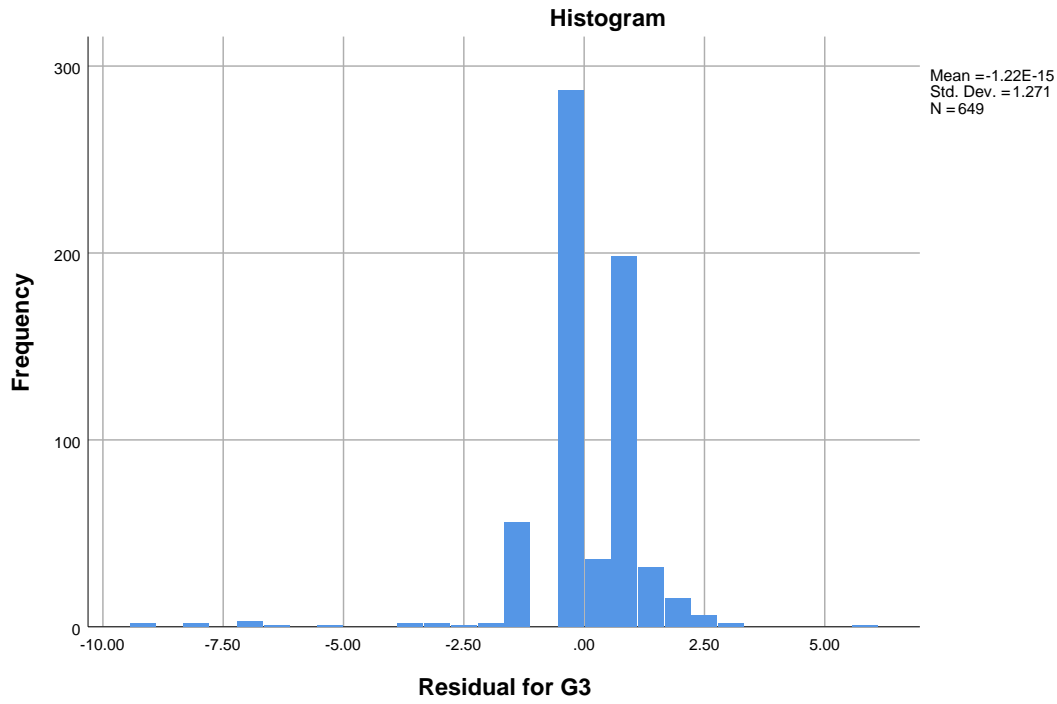
Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
RES_1	.243	649	.000	.732	649	.000

a. Lilliefors Significance Correction

Residual for G3

ANCOVA residual normality
Residual output after ANCOVA model



ANCOVA residual normality
Residual output after ANCOVA model

