

```
1898 0 OUTPUT ACTIVATE PathAnalysisOutput.  
1898 0 M> OUTPUT ACTIVATE PathAnalysisOutput.  
1899 0 TITLE 'Observed-Variable Path Analysis'.  
1899 0 M> TITLE 'Observed-Variable Path Analysis'.
```

Observed-Variable Path Analysis

```
1900 0
1900 0 M>
1901 0 GET DATA
1901 0 M> GET DATA
1902 0 /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Path Analysis\dataset.csv' /ENCODING='UTF8'
      /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='"'
1902 0 M> /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Path Analysis\dataset.csv' /ENCODING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='"'
1903 0 /ARRANGEMENT=DELIMITED /FIRSTCASE=2
1903 0 M> /ARRANGEMENT=DELIMITED /FIRSTCASE=2
1904 0 /VARIABLES=
1904 0 M> /VARIABLES=
1905 0 school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0 Fedu F8.0
1905 0 M> school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0 Fedu F8.0
1906 0 Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime F8.0 failures F8.0
1906 0 M> Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime F8.0 failures F8.0
1907 0 schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 internet A8 romantic A8
1907 0 M> schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 internet A8 romantic A8
1908 0 famrel F8.0 freetime F8.0 goout F8.0 Dalc F8.0 Walc F8.0 health F8.0 absences F8.0 G1 F8.0 G2 F8.0 G3 F8.0.
1908 0 M> famrel F8.0 freetime F8.0 goout F8.0 Dalc F8.0 Walc F8.0 health F8.0 absences F8.0 G1 F8.0 G2 F8.0 G3 F8.0.
1909 0 DATASET NAME PathAnalysisData.
1909 0 M> DATASET NAME PathAnalysisData.
1910 0 COMPUTE subject_id=$CASENUM.
1910 0 M> COMPUTE subject_id=$CASENUM.
1911 0 COMPUTE Dalc_R=6-Dalc.
1911 0 M> COMPUTE Dalc_R=6-Dalc.
1912 0 COMPUTE Walc_R=6-Walc.
1912 0 M> COMPUTE Walc_R=6-Walc.
```

Observed-Variable Path Analysis

```
1913  0  RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
1913  0 M> RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
1914  0  INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b.
1914  0 M> INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b
.
1915  0  EXECUTE.
1915  0 M> EXECUTE.
1916  0
1916  0 M>
1917  0  * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1917  0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
1918  0  TITLE 'Observed Variable Path Analysis'.
1918  0 M> TITLE 'Observed Variable Path Analysis'.
```

Observed Variable Path Analysis

```
1919 0 SUBTITLE 'G3 paths from G1 study time failures and absences'.  
1919 0 M> SUBTITLE 'G3 paths from G1 study time failures and absences'.
```

Observed Variable Path Analysis
G3 paths from G1 study time failures and absences

1920 0 DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout studytime failures absences /SAVE.

1920 0 M> DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout studytime failures absences /SAVE.

Descriptives

Notes

Output Created		18-JUL-2026 10:57:21
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Path Analysis\dataset.csv
	Active Dataset	PathAnalysisData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	All non-missing data are used.
Syntax		DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout studytime failures absences /SAVE.
Resources	Processor Time	00:00:00.08
	Elapsed Time	00:00:00.05
Variables Created or Modified	ZG1	Zscore(G1)
	ZG2	Zscore(G2)
	ZG3	Zscore(G3)
	Zfamrel	Zscore(famrel)
	Zfreetime	Zscore(freetime)
	Zgoout	Zscore(goout)
	Zstudytime	Zscore(studytime)

Observed Variable Path Analysis
G3 paths from G1 study time failures and absences

Notes

	Zfailures	Zscore(failures)
	Zabsences	Zscore(absences)

[PathAnalysisData]

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
G1	649	0	19	11.40	2.745
G2	649	0	19	11.57	2.914
G3	649	0	19	11.91	3.231
famrel	649	1	5	3.93	.956
freetime	649	1	5	3.18	1.051
goout	649	1	5	3.18	1.176
studytime	649	1	4	1.93	.830
failures	649	0	3	.22	.593
absences	649	0	32	3.66	4.641
Valid N (listwise)	649				

```

1921  0  REGRESSION /STATISTICS=COEFF OUTS R ANOVA CHANGE CI(95) /DEPENDENT ZG
3
1921  0 M>  REGRESSION /STATISTICS=COEFF OUTS R ANOVA CHANGE CI(95) /DEPENDENT
ZG3
1922  0  /METHOD=ENTER ZG1 Zstudytime Zfailures Zabsences /SAVE PRED RESID.
1922  0 M>  /METHOD=ENTER ZG1 Zstudytime Zfailures Zabsences /SAVE PRED RESID
.

```

Regression

Observed Variable Path Analysis
G3 paths from G1 study time failures and absences

Notes

Output Created		18-JUL-2026 10:57:21
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Path Analysis\dataset.csv
	Active Dataset	PathAnalysisData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on cases with no missing values for any variable used.
Syntax		REGRESSION /STATISTICS=COEFF OUTS R ANOVA CHANGE CI(95) /DEPENDENT ZG3 /METHOD=ENTER ZG1 Zstudytime Zfailures Zabsences /SAVE PRED ...
Resources	Processor Time	00:00:00.08
	Elapsed Time	00:00:00.08
	Memory Required	6112 bytes
	Additional Memory Required for Residual Plots	0 bytes
Variables Created or Modified	PRE_1	Unstandardized Predicted Value
	RES_1	Unstandardized Residual

Observed Variable Path Analysis
G3 paths from G1 study time failures and absences

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	Zscore (absences), Zscore (studytime), Zscore (failures), Zscore(G1) ^b	.	Enter

a. Dependent Variable: Zscore(G3)

b. All requested variables entered.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.832 ^a	.692	.690	.55654826	.692	362.009	4

Model Summary^b

Model	Change Statistics	
	df2	Sig. F Change
1	644	.000

a. Predictors: (Constant), Zscore(absences), Zscore(studytime), Zscore(failures), Zscore(G1)

b. Dependent Variable: Zscore(G3)

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	448.524	4	112.131	362.009	.000 ^b
	Residual	199.476	644	.310		
	Total	648.000	648			

a. Dependent Variable: Zscore(G3)

b. Predictors: (Constant), Zscore(absences), Zscore(studytime), Zscore(failures), Zscore(G1)

Observed Variable Path Analysis
G3 paths from G1 study time failures and absences

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.278E-15	.022		.000	1.000
	Zscore(G1)	.788	.024	.788	32.320	.000
	Zscore(studytime)	.036	.023	.036	1.563	.119
	Zscore(failures)	-.090	.024	-.090	-3.789	.000
	Zscore(absences)	.040	.022	.040	1.794	.073

Coefficients^a

Model		95.0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	-.043	.043
	Zscore(G1)	.740	.836
	Zscore(studytime)	-.009	.080
	Zscore(failures)	-.137	-.043
	Zscore(absences)	-.004	.084

a. Dependent Variable: Zscore(G3)

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-3.2339556	2.2308772	.0000000	.83196517	649
Residual	-3.22938776	2.95351458	.00000000	.55482786	649
Std. Predicted Value	-3.887	2.681	.000	1.000	649
Std. Residual	-5.803	5.307	.000	.997	649

a. Dependent Variable: Zscore(G3)

```
1923  0  CORRELATIONS /VARIABLES=ZG1 ZG2 ZG3 Zfamrel Zfreetime Zgoout /PRINT=T
WOTAIL NOSIG /MISSING=PAIRWISE.
1923  0  M> CORRELATIONS /VARIABLES=ZG1 ZG2 ZG3 Zfamrel Zfreetime Zgoout /PRIN
T=TWOTAIL NOSIG /MISSING=PAIRWISE.
```

Correlations

Observed Variable Path Analysis
G3 paths from G1 study time failures and absences

Notes

Output Created		18-JUL-2026 10:57:21
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Path Analysis\dataset.csv
	Active Dataset	PathAnalysisData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each pair of variables are based on all the cases with valid data for that pair.
Syntax		CORRELATIONS /VARIABLES=ZG1 ZG2 ZG3 Zfamrel Zfreetime Zgoout /PRINT=TWOTAIL NOSIG /MISSING=PAIRWISE.
Resources	Processor Time	00:00:00.03
	Elapsed Time	00:00:00.04

Observed Variable Path Analysis
G3 paths from G1 study time failures and absences

Correlations

		Zscore(G1)	Zscore(G2)	Zscore(G3)	Zscore(famrel)
Zscore(G1)	Pearson Correlation	1	.865**	.826**	.049
	Sig. (2-tailed)		.000	.000	.214
	N	649	649	649	649
Zscore(G2)	Pearson Correlation	.865**	1	.919**	.090*
	Sig. (2-tailed)	.000		.000	.022
	N	649	649	649	649
Zscore(G3)	Pearson Correlation	.826**	.919**	1	.063
	Sig. (2-tailed)	.000	.000		.107
	N	649	649	649	649
Zscore(famrel)	Pearson Correlation	.049	.090*	.063	1
	Sig. (2-tailed)	.214	.022	.107	
	N	649	649	649	649
Zscore(freetime)	Pearson Correlation	-.094*	-.107**	-.123**	.129**
	Sig. (2-tailed)	.016	.007	.002	.001
	N	649	649	649	649
Zscore(goout)	Pearson Correlation	-.074	-.079*	-.088*	.090*
	Sig. (2-tailed)	.059	.043	.026	.022
	N	649	649	649	649

Observed Variable Path Analysis
G3 paths from G1 study time failures and absences

Correlations

		Zscore (freetime)	Zscore(goout)
Zscore(G1)	Pearson Correlation	-.094 [*]	-.074
	Sig. (2-tailed)	.016	.059
	N	649	649
Zscore(G2)	Pearson Correlation	-.107 ^{**}	-.079 [*]
	Sig. (2-tailed)	.007	.043
	N	649	649
Zscore(G3)	Pearson Correlation	-.123 ^{**}	-.088 [*]
	Sig. (2-tailed)	.002	.026
	N	649	649
Zscore(famrel)	Pearson Correlation	.129 ^{**}	.090 [*]
	Sig. (2-tailed)	.001	.022
	N	649	649
Zscore(freetime)	Pearson Correlation	1	.346 ^{**}
	Sig. (2-tailed)		.000
	N	649	649
Zscore(goout)	Pearson Correlation	.346 ^{**}	1
	Sig. (2-tailed)	.000	
	N	649	649

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

^{*}. Correlation is significant at the 0.05 level (2-tailed).

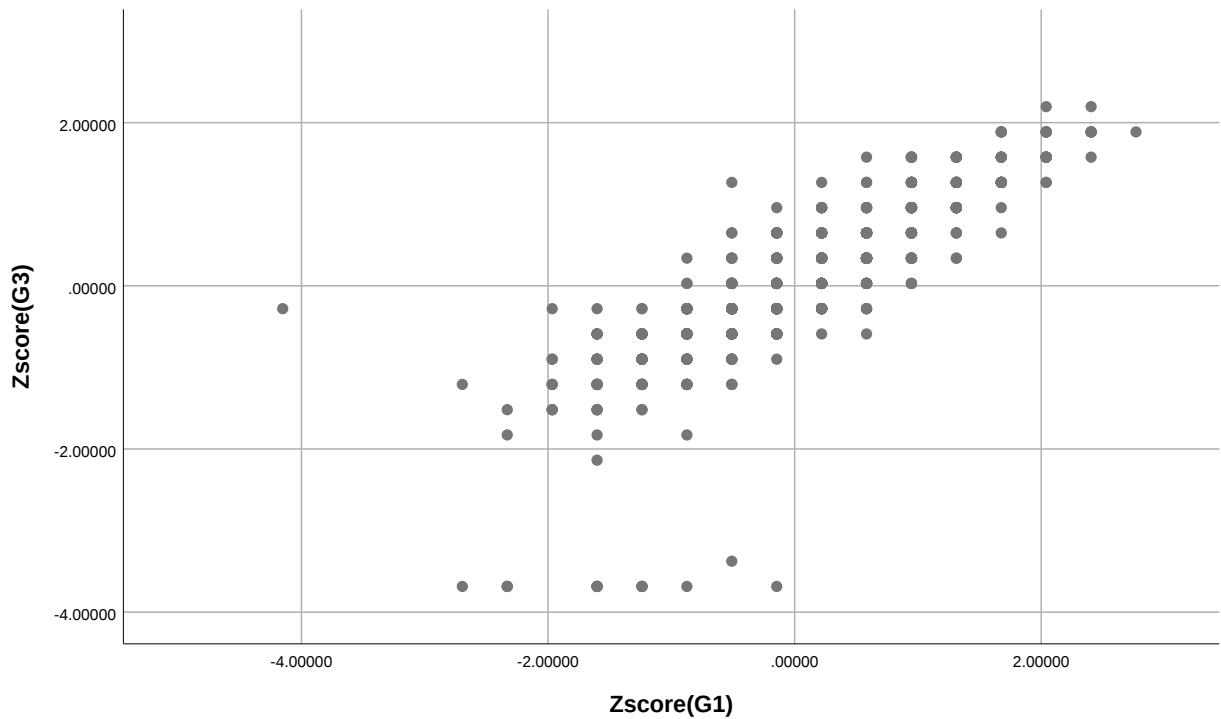
```
1924  0  GRAPH /SCATTERPLOT(BIVAR)=ZG1 WITH ZG3.
1924  0  M>  GRAPH /SCATTERPLOT(BIVAR)=ZG1 WITH ZG3.
```

Graph

Observed Variable Path Analysis
G3 paths from G1 study time failures and absences

Notes

Output Created		18-JUL-2026 10:57:21
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Path Analysis\dataset.csv
	Active Dataset	PathAnalysisData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Syntax		GRAPH /SCATTERPLOT (BIVAR)=ZG1 WITH ZG3.
Resources	Processor Time	00:00:00.28
	Elapsed Time	00:00:00.25



1925 0 * END METHOD-SPECIFIC SPSS WORKFLOW.

Observed Variable Path Analysis
G3 paths from G1 study time failures and absences

```

1925  0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.
1926  0
1926  0 M>
1927  0 SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale T
esting\Path Analysis\SPSS_Output\sav\path-analysis_sps
      s_ready_data.sav' /COMPRESSED.
1927  0 M> SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scal
e Testing\Path Analysis\SPSS_Output\sav\path-analysis_
      spss_ready_data.sav' /COMPRESSED.
1928  0
1928  0 M>
1929  0 ECHO '=====
====='.
1929  0 M> ECHO '=====
====='.
=====
1930  0 ECHO 'OBSERVED-VARIABLE PATH ANALYSIS'.
1930  0 M> ECHO 'OBSERVED-VARIABLE PATH ANALYSIS'.
OBSERVED-VARIABLE PATH ANALYSIS
1931  0 ECHO 'Design: Multiple regression path model predicting G3 from prior
grade, study time, failures, and absences.'.
1931  0 M> ECHO 'Design: Multiple regression path model predicting G3 from pr
ior grade, study time, failures, and absences.'.
Design: Multiple regression path model predicting G3 from prior grade, study t
ime, failures, and absences.
1932  0 ECHO 'Null hypothesis: All direct path coefficients to G3 are zero.'.
1932  0 M> ECHO 'Null hypothesis: All direct path coefficients to G3 are zero
.'.
Null hypothesis: All direct path coefficients to G3 are zero.
1933  0 ECHO 'Formula: G3=beta0+beta1 z(G1)+beta2 z(studytime)+beta3 z(failur
es)+beta4 z(absences)+e.'.
1933  0 M> ECHO 'Formula: G3=beta0+beta1 z(G1)+beta2 z(studytime)+beta3 z(fai
lures)+beta4 z(absences)+e.'.
Formula: G3=beta0+beta1 z(G1)+beta2 z(studytime)+beta3 z(failures)+beta4 z(abs
ences)+e.
1934  0 ECHO 'Variables: G3, G1, studytime, failures, absences'.
1934  0 M> ECHO 'Variables: G3, G1, studytime, failures, absences'.
Variables: G3, G1, studytime, failures, absences
1935  0 ECHO 'Rows analyzed: 649'.

```

Observed Variable Path Analysis
G3 paths from G1 study time failures and absences

```
1935  0 M> ECHO 'Rows analyzed: 649'.
Rows analyzed: 649
1936  0 ECHO 'absences_path = 0.128899115849754'.
1936  0 M> ECHO 'absences_path = 0.128899115849754'.
absences_path = 0.128899115849754
1937  0 ECHO 'failures_path = -0.29098094744247344'.
1937  0 M> ECHO 'failures_path = -0.29098094744247344'.
failures_path = -0.29098094744247344
1938  0 ECHO 'g1_path = 2.5469681421179513'.
1938  0 M> ECHO 'g1_path = 2.5469681421179513'.
g1_path = 2.5469681421179513
1939  0 ECHO 'n_cases = 649'.
1939  0 M> ECHO 'n_cases = 649'.
n_cases = 649
1940  0 ECHO 'r_squared = 0.6921660445654284'.
1940  0 M> ECHO 'r_squared = 0.6921660445654284'.
r_squared = 0.6921660445654284
1941  0 ECHO 'studytime_path = 0.11489800361983993'.
1941  0 M> ECHO 'studytime_path = 0.11489800361983993'.
studytime_path = 0.11489800361983993
1942  0 ECHO 'Cross-check status: pass'.
1942  0 M> ECHO 'Cross-check status: pass'.
Cross-check status: pass
1943  0 ECHO '=====
====='.
1943  0 M> ECHO '=====
====='.
=====
1944  0
1944  0 M>
1945  0 OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and
Scale Testing\Path Analysis\SPSS_Output\spv\path-analy
sis_spss_output.spv'.
1945  0 M> OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis a
nd Scale Testing\Path Analysis\SPSS_Output\spv\path-an
alysis_spss_output.spv'.
1946  0 OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING
```

Observed Variable Path Analysis
G3 paths from G1 study time failures and absences

```
1946  0 M>  OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=  
PRINTSETTING
```