```
2436  0  OUTPUT ACTIVATE StructuralEquationModelingOutput.
2436  0 M>  OUTPUT ACTIVATE StructuralEquationModelingOutput.
2437  0  TITLE 'Latent-Score Mediation SEM'.
2437  0 M>  TITLE 'Latent-Score Mediation SEM'.
```

```
2438  0
2438  0 M>
2439  0  GET DATA
2439  0 M>  GET DATA
2440  0   /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Sca
le Testing\Structural Equation Modeling\dataset.csv' /
            ENCODING='UTF8' /DELCASE=LINE /DELIMITERS=',' /QUALIFIER='"'
2440  0 M>   /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and
Scale Testing\Structural Equation Modeling\dataset.csv
              ' /ENCODING='UTF8' /DELCASE=LINE /DELIMITERS=',' /QUALIFIER='"'
2441  0   /ARRANGEMENT=DELIMITED /FIRSTCASE=2
2441  0 M>   /ARRANGEMENT=DELIMITED /FIRSTCASE=2
2442  0   /VARIABLES=
2442  0 M>   /VARIABLES=
2443  0   school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0
 Fedu F8.0
2443  0 M>   school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F
8.0 Fedu F8.0
2444  0   Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime
F8.0 failures F8.0
2444  0 M>   Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studyti
me F8.0 failures F8.0
2445  0   schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 in
ternet A8 romantic A8
2445  0 M>   schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8
 internet A8 romantic A8
2446  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.
2446  0 M>   famrel F8.0 freetime F8.0 goout F8.0 Dalc F8.0 Walc F8.0 health F
8.0 absences F8.0 G1 F8.0 G2 F8.0 G3 F8.0.
2447  0  DATASET NAME StructuralEquationModelingData.
2447  0 M>  DATASET NAME StructuralEquationModelingData.
2448  0  COMPUTE subject_id=$CASENUM.
2448  0 M>  COMPUTE subject_id=$CASENUM.
2449  0  COMPUTE Dalc_R=6-Dalc.
2449  0 M>  COMPUTE Dalc_R=6-Dalc.
2450  0  COMPUTE Walc_R=6-Walc.
2450  0 M>  COMPUTE Walc_R=6-Walc.
```

```
2451  0  RECODE schoolsup famsup paid activities higher internet ('no'=0) ('ye
s'=1)
2451  0 M>  RECODE schoolsup famsup paid activities higher internet ('no'=0) (
'yes'=1)
2452  0   INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b.
2452  0 M>   INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b
.
2453  0  EXECUTE.
2453  0 M>  EXECUTE.
2454  0
2454  0 M>
2455  0  * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
2455  0 M>  * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
2456  0  TITLE 'Latent Score Mediation SEM'.
2456  0 M>  TITLE 'Latent Score Mediation SEM'.
```

```
2457  0  SUBTITLE 'Engagement behavior and academic direct and indirect effect
s'.
2457  0 M>  SUBTITLE 'Engagement behavior and academic direct and indirect eff
ects'.
```

```
2458  0  DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout studytime failu
res absences /SAVE.
2458  0 M>  DESCRIPTIVES VARIABLES=G1 G2 G3 famrel freetime goout studytime fa
ilures absences /SAVE.
```

Descriptives

Notes

Output Created		18-JUL-2026 10:58:04
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Structural Equation Modeling\dataset.csv
	Active Dataset	StructuralEquationModelingData
	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	00:00:00.07
Variables Created or Modified	ZG1	Zscore(G1)
	ZG2	Zscore(G2)
	ZG3	Zscore(G3)
	Zfamrel	Zscore(famrel)
	Zfreetime	Zscore(freetime)

Notes

	Zgoout	Zscore(goout)
	Zstudytime	Zscore(studytime)
	Zfailures	Zscore(failures)
	Zabsences	Zscore(absences)

[StructuralEquationModelingData]

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				

```
2459  0  REGRESSION /STATISTICS=COEFF OUTS R ANOVA CHANGE CI(95) /DEPENDENT ZG
3
2459  0 M>  REGRESSION /STATISTICS=COEFF OUTS R ANOVA CHANGE CI(95) /DEPENDENT
 ZG3
2460  0   /METHOD=ENTER ZG1 Zstudytime Zfailures Zabsences /SAVE PRED RESID.
2460  0 M>   /METHOD=ENTER ZG1 Zstudytime Zfailures Zabsences /SAVE PRED RESID
.
```

Regression

Latent Score Mediation SEM
Engagement behavior and academic direct and indirect effects

Notes

Output Created		18-JUL-2026 10:58:04
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Structural Equation Modeling\dataset.csv
	Active Dataset	StructuralEquationModelingData
	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	00:00:00.09
	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

Latent Score Mediation SEM
Engagement behavior and academic direct and indirect effects

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)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
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)

```
2461  0  CORRELATIONS /VARIABLES=ZG1 ZG2 ZG3 Zfamrel Zfreetime Zgoout /PRINT=T
WOTAIL NOSIG /MISSING=PAIRWISE.
2461  0 M>  CORRELATIONS /VARIABLES=ZG1 ZG2 ZG3 Zfamrel Zfreetime Zgoout /PRIN
T=TWOTAIL NOSIG /MISSING=PAIRWISE.
```

Correlations

Latent Score Mediation SEM
Engagement behavior and academic direct and indirect effects

Notes

Output Created		18-JUL-2026 10:58:04
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Structural Equation Modeling\dataset.csv
	Active Dataset	StructuralEquationModelingData
	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	00:00:00.06
	Elapsed Time	00:00:00.04

Latent Score Mediation SEM
Engagement behavior and academic direct and indirect effects

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

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).

```
2462  0  COMPUTE engagement=MEAN(studytime,famrel,health).
2462  0 M>  COMPUTE engagement=MEAN(studytime,famrel,health).
2463  0  COMPUTE behavior=MEAN(Dalc_R,Walc_R,failures).
2463  0 M>  COMPUTE behavior=MEAN(Dalc_R,Walc_R,failures).
2464  0  REGRESSION /STATISTICS=COEFF R ANOVA /DEPENDENT behavior /METHOD=ENTE
R engagement.
2464  0 M>  REGRESSION /STATISTICS=COEFF R ANOVA /DEPENDENT behavior /METHOD=E
NTER engagement.
```

Regression

Notes

Output Created		18-JUL-2026 10:58:04
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Structural Equation Modeling\dataset.csv
	Active Dataset	StructuralEquationModelingData
	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 R ANOVA /DEPENDENT behavior /METHOD=ENTER engagement.
Resources	Processor Time	00:00:00.06
	Elapsed Time	00:00:00.07
	Memory Required	4688 bytes
	Additional Memory Required for Residual Plots	0 bytes

Latent Score Mediation SEM
Engagement behavior and academic direct and indirect effects

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	engagement[b]	.	Enter

a. Dependent Variable: behavior

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.037[a]	.001	.000	.67336

a. Predictors: (Constant), engagement

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.399	1	.399	.880	.349[b]
	Residual	293.362	647	.453		
	Total	293.761	648			

a. Dependent Variable: behavior

b. Predictors: (Constant), engagement

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.694	.129		20.829	.000
	engagement	.038	.040	.037	.938	.349

a. Dependent Variable: behavior

```
2465  0  REGRESSION /STATISTICS=COEFF R ANOVA /DEPENDENT G3 /METHOD=ENTER beha
vior engagement.
```

```
2465  0 M>  REGRESSION /STATISTICS=COEFF R ANOVA /DEPENDENT G3 /METHOD=ENTER b
ehavior engagement.
```

Regression

Notes

Output Created		18-JUL-2026 10:58:04
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Structural Equation Modeling\dataset.csv
	Active Dataset	StructuralEquationModelingData
	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 R ANOVA /DEPENDENT G3 /METHOD=ENTER behavior engagement.
Resources	Processor Time	00:00:00.05
	Elapsed Time	00:00:00.03
	Memory Required	5136 bytes
	Additional Memory Required for Residual Plots	0 bytes

Latent Score Mediation SEM
Engagement behavior and academic direct and indirect effects

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	engagement, behavior[b]	.	Enter

a. Dependent Variable: G3

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.109[a]	.012	.009	3.216

a. Predictors: (Constant), engagement, behavior

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	79.990	2	39.995	3.866	.021[b]
	Residual	6683.276	646	10.346		
	Total	6763.267	648			

a. Dependent Variable: G3

b. Predictors: (Constant), engagement, behavior

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	9.781	.799		12.248	.000
	behavior	.424	.188	.088	2.256	.024
	engagement	.298	.193	.060	1.541	.124

a. Dependent Variable: G3

```
2466  0  * END METHOD-SPECIFIC SPSS WORKFLOW.
```

```
2466  0 M>  * END METHOD-SPECIFIC SPSS WORKFLOW.
2467  0
2467  0 M>
2468  0  SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale T
esting\Structural Equation Modeling\SPSS_Output\sav\st
            ructural-equation-modeling_spss_ready_data.sav' /COMPRESSED.
2468  0 M>  SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scal
e Testing\Structural Equation Modeling\SPSS_Output\sav
              \structural-equation-modeling_spss_ready_data.sav' /COMPRESSED.
2469  0
2469  0 M>
2470  0  ECHO '============================================================
=========='.
2470  0 M>  ECHO '============================================================
============'.
============================================================================
2471  0  ECHO 'LATENT-SCORE MEDIATION SEM'.
2471  0 M>  ECHO 'LATENT-SCORE MEDIATION SEM'.
LATENT-SCORE MEDIATION SEM
2472  0  ECHO 'Design: Measurement-informed engagement, behavior, and academic
 scores linked in a mediation structure.'.
2472  0 M>  ECHO 'Design: Measurement-informed engagement, behavior, and acade
mic scores linked in a mediation structure.'.
Design: Measurement-informed engagement, behavior, and academic scores linked
in a mediation structure.
2473  0  ECHO 'Null hypothesis: Engagement has neither direct nor indirect ass
ociation with academic achievement.'.
2473  0 M>  ECHO 'Null hypothesis: Engagement has neither direct nor indirect
association with academic achievement.'.
Null hypothesis: Engagement has neither direct nor indirect association with a
cademic achievement.
2474  0  ECHO 'Formula: Behavior=a Engagement+u; Academic=b Behavior+c'' Engag
ement+e; indirect=a*b.'.
2474  0 M>  ECHO 'Formula: Behavior=a Engagement+u; Academic=b Behavior+c'' En
gagement+e; indirect=a*b.'.
Formula: Behavior=a Engagement+u; Academic=b Behavior+c' Engagement+e; indirec
t=a*b.
2475  0  ECHO 'Variables: G1, G2, G3, famrel, freetime, goout, studytime, heal
th, Dalc, Walc, failures'.
```

```
2475  0 M>  ECHO 'Variables: G1, G2, G3, famrel, freetime, goout, studytime, h
ealth, Dalc, Walc, failures'.
Variables: G1, G2, G3, famrel, freetime, goout, studytime, health, Dalc, Walc,
 failures
2476  0  ECHO 'Rows analyzed: 649'.
2476  0 M>  ECHO 'Rows analyzed: 649'.
Rows analyzed: 649
2477  0  ECHO 'academic_r_squared = 0.14220793441771185'.
2477  0 M>  ECHO 'academic_r_squared = 0.14220793441771185'.
academic_r_squared = 0.14220793441771185
2478  0  ECHO 'behavior_to_academic = 0.4925065042856399'.
2478  0 M>  ECHO 'behavior_to_academic = 0.4925065042856399'.
behavior_to_academic = 0.4925065042856399
2479  0  ECHO 'direct_effect = 0.16010130763925542'.
2479  0 M>  ECHO 'direct_effect = 0.16010130763925542'.
direct_effect = 0.16010130763925542
2480  0  ECHO 'engagement_to_behavior = 0.16857009200456385'.
2480  0 M>  ECHO 'engagement_to_behavior = 0.16857009200456385'.
engagement_to_behavior = 0.16857009200456385
2481  0  ECHO 'indirect_effect = 0.08302186674027644'.
2481  0 M>  ECHO 'indirect_effect = 0.08302186674027644'.
indirect_effect = 0.08302186674027644
2482  0  ECHO 'total_effect = 0.24312317437953185'.
2482  0 M>  ECHO 'total_effect = 0.24312317437953185'.
total_effect = 0.24312317437953185
2483  0  ECHO 'Cross-check status: pass'.
2483  0 M>  ECHO 'Cross-check status: pass'.
Cross-check status: pass
2484  0  ECHO '==========================================================
=========='.
2484  0 M>  ECHO '==========================================================
============'.
==============================================================================
2485  0
2485  0 M>
2486  0  OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and
Scale Testing\Structural Equation Modeling\SPSS_Output
            \spv\structural-equation-modeling_spss_output.spv'.
```

```
2486  0 M>  OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis a
nd Scale Testing\Structural Equation Modeling\SPSS_Out
               put\spv\structural-equation-modeling_spss_output.spv'.
2487  0  OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING
2487  0 M>  OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=
PRINTSETTING
```