

```
105 0 OUTPUT ACTIVATE AverageVarianceExtractedOutput.  
105 0 M> OUTPUT ACTIVATE AverageVarianceExtractedOutput.  
106 0 TITLE 'Average Variance Extracted'.  
106 0 M> TITLE 'Average Variance Extracted'.
```

Average Variance Extracted

```
107 0
107 0 M>
108 0 GET DATA
108 0 M> GET DATA
109 0 /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Average Variance Extracted\dataset.csv' /EN
      CODING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='"'
109 0 M> /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Average Variance Extracted\dataset.csv'
      /ENCODING='UTF8' /DELCASE=LINE /DELIMITERS=', ' /QUALIFIER='"'
110 0 /ARRANGEMENT=DELIMITED /FIRSTCASE=2
110 0 M> /ARRANGEMENT=DELIMITED /FIRSTCASE=2
111 0 /VARIABLES=
111 0 M> /VARIABLES=
112 0 school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0
Fedu F8.0
112 0 M> school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F
8.0 Fedu F8.0
113 0 Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime
F8.0 failures F8.0
113 0 M> Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studyti
me F8.0 failures F8.0
114 0 schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 in
ternet A8 romantic A8
114 0 M> schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8
internet A8 romantic A8
115 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.
115 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.
116 0 DATASET NAME AverageVarianceExtractedData.
116 0 M> DATASET NAME AverageVarianceExtractedData.
117 0 COMPUTE subject_id=$CASENUM.
117 0 M> COMPUTE subject_id=$CASENUM.
118 0 COMPUTE Dalc_R=6-Dalc.
118 0 M> COMPUTE Dalc_R=6-Dalc.
119 0 COMPUTE Walc_R=6-Walc.
119 0 M> COMPUTE Walc_R=6-Walc.
```

Average Variance Extracted

```
120 0 RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
120 0 M> RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
121 0 INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b.
121 0 M> INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b
.
122 0 EXECUTE.
122 0 M> EXECUTE.
123 0
123 0 M>
124 0 * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
124 0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
125 0 TITLE 'Average Variance Extracted'.
125 0 M> TITLE 'Average Variance Extracted'.
```

Average Variance Extracted

```
126 0 SUBTITLE 'Construct-specific squared-loading and uniqueness evidence'  
.  
126 0 M> SUBTITLE 'Construct-specific squared-loading and uniqueness eviden  
ce'.
```

Average Variance Extracted
Construct-specific squared-loading and uniqueness evidence

```

127  0  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE /A
NALYSIS=G1 G2 G3 famrel freetime goout
127  0 M>  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE
/ANALYSIS=G1 G2 G3 famrel freetime goout
128  0    /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN
128  0 M>    /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN
129  0    /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PAF /ROTATION=NOROTATE
/METHOD=CORRELATION.
129  0 M>    /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PAF /ROTATION=NOROT
ATE /METHOD=CORRELATION.

```

Factor Analysis

Notes

Output Created		18-JUL-2026 10:53:58
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Average Variance Extracted\dataset.csv
	Active Dataset	AverageVarianceExtracted Data
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.

Average Variance Extracted
Construct-specific squared-loading and uniqueness evidence

Notes

Syntax		FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE /ANALYSIS=G1 G2 G3 famrel freetime goout /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PAF /ROTATION=NOROTATE /METHOD=CORRELATIO N.
Resources	Processor Time	00:00:00.88
	Elapsed Time	00:00:00.79
	Maximum Memory Required	5704 (5.570K) bytes

[AverageVarianceExtractedData]

Correlation Matrix

		G1	G2	G3	famrel	freetime	goout
Correlation	G1	1.000	.865	.826	.049	-.094	-.074
	G2	.865	1.000	.919	.090	-.107	-.079
	G3	.826	.919	1.000	.063	-.123	-.088
	famrel	.049	.090	.063	1.000	.129	.090
	freetime	-.094	-.107	-.123	.129	1.000	.346
	goout	-.074	-.079	-.088	.090	.346	1.000

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.732
Bartlett's Test of Sphericity	Approx. Chi-Square	2220.632
	df	15
	Sig.	.000

Average Variance Extracted
Construct-specific squared-loading and uniqueness evidence

Communalities

	Initial	Extraction
G1	.755	.775
G2	.880	.966
G3	.849	.878
famrel	.034	.045
freetime	.140	.474
goout	.125	.252

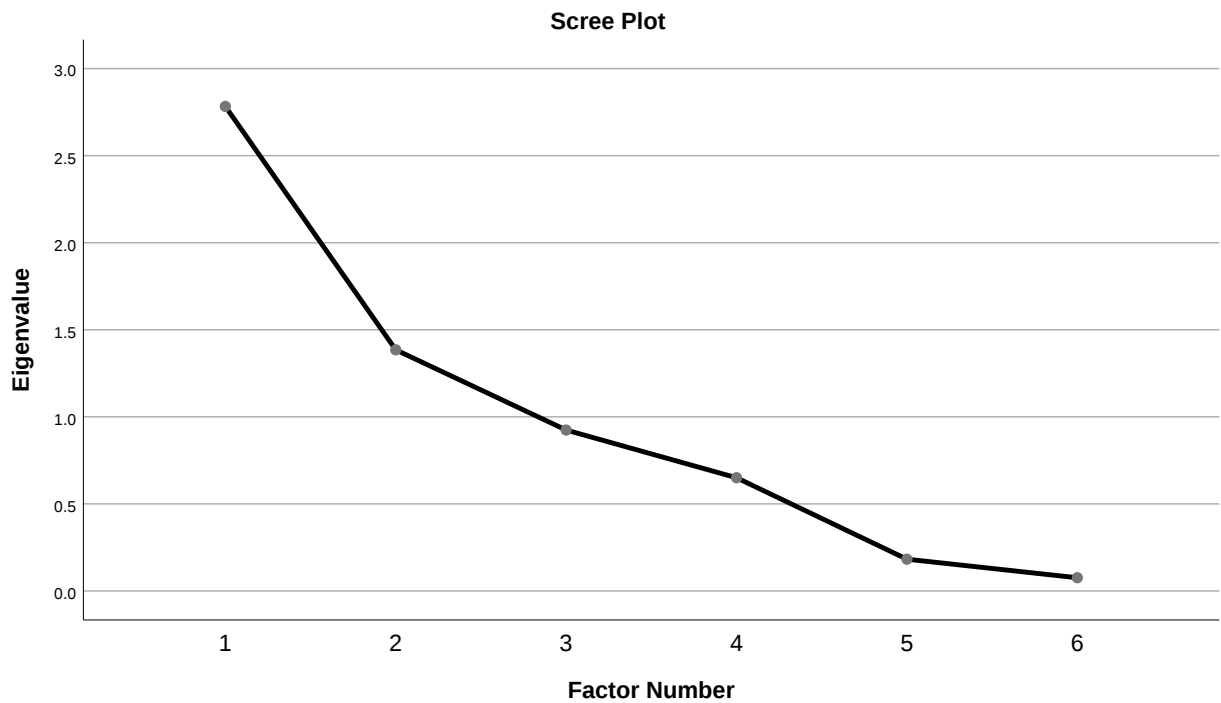
Extraction Method: Principal Axis Factoring.

Total Variance Explained

Factor	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.783	46.381	46.381	2.650	44.166	44.166
2	1.385	23.080	69.461	.740	12.337	56.503
3	.924	15.402	84.863			
4	.650	10.835	95.698			
5	.182	3.038	98.736			
6	.076	1.264	100.000			

Extraction Method: Principal Axis Factoring.

Average Variance Extracted
Construct-specific squared-loading and uniqueness evidence



Factor Matrix^a

	Factor	
	1	2
G1	.879	.053
G2	.980	.070
G3	.936	.033
famrel	.061	.204
freetime	-.153	.671
goout	-.114	.489

Extraction Method: Principal Axis Factoring.

a. 2 factors extracted. 41 iterations required.

```
130 0 RELIABILITY /VARIABLES=G1 G2 G3 /SCALE('Academic measurement block')
ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE CORR.
130 0 M> RELIABILITY /VARIABLES=G1 G2 G3 /SCALE('Academic measurement block
') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE CORR
```

Average Variance Extracted
Construct-specific squared-loading and uniqueness evidence

Reliability

Notes

Output Created		18-JUL-2026 10:53:58
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Average Variance Extracted\dataset.csv
	Active Dataset	AverageVarianceExtracted Data
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
	Matrix Input	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Average Variance Extracted\average_varianc e_extracted_spss_syntax. sps
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=G1 G2 G3 /SCALE('Academic measurement block') ALL /MODEL=ALPHA /STATISTICS=DESCRIPT IVE SCALE CORR.
Resources	Processor Time	00:00:00.06
	Elapsed Time	00:00:00.06

Average Variance Extracted
Construct-specific squared-loading and uniqueness evidence

Scale: Academic measurement block

Case Processing Summary

		N	%
Cases	Valid	649	100.0
	Excluded ^a	0	.0
	Total	649	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.951	.953	3

Item Statistics

	Mean	Std. Deviation	N
G1	11.40	2.745	649
G2	11.57	2.914	649
G3	11.91	3.231	649

Inter-Item Correlation Matrix

	G1	G2	G3
G1	1.000	.865	.826
G2	.865	1.000	.919
G3	.826	.919	1.000

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
34.88	72.251	8.500	3

Average Variance Extracted
Construct-specific squared-loading and uniqueness evidence

```
131  0  RELIABILITY /VARIABLES=famrel freetime goout /SCALE('Social measureme
nt block') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SC
      ALE CORR.
131  0  M> RELIABILITY /VARIABLES=famrel freetime goout /SCALE('Social measur
ement block') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE
      SCALE CORR.
```

Reliability

Notes

Output Created		18-JUL-2026 10:53:59
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Average Variance Extracted\dataset.csv
	Active Dataset	AverageVarianceExtracted Data
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
	Matrix Input	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Average Variance Extracted\average_varianc e_extracted_spss_syntax. sps
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Average Variance Extracted
Construct-specific squared-loading and uniqueness evidence

Notes

Syntax		RELIABILITY /VARIABLES=famrel freetime goout /SCALE ('Social measurement block') ALL /MODEL=ALPHA /STATISTICS=DESCRIPT IVE SCALE CORR.
Resources	Processor Time	00:00:00.05
	Elapsed Time	00:00:00.09

Scale: Social measurement block

Case Processing Summary

		N	%
Cases	Valid	649	100.0
	Excluded ^a	0	.0
	Total	649	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.419	.411	3

Item Statistics

	Mean	Std. Deviation	N
famrel	3.93	.956	649
freetime	3.18	1.051	649
goout	3.18	1.176	649

Average Variance Extracted
Construct-specific squared-loading and uniqueness evidence

Inter-Item Correlation Matrix

	famrel	freetime	goout
famrel	1.000	.129	.090
freetime	.129	1.000	.346
goout	.090	.346	1.000

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
10.30	4.718	2.172	3

132 0 ECHO 'AVE is computed separately for academic and social CFA indicator blocks'.

132 0 M> ECHO 'AVE is computed separately for academic and social CFA indicator blocks'.

AVE is computed separately for academic and social CFA indicator blocks

133 0 * END METHOD-SPECIFIC SPSS WORKFLOW.

133 0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.

134 0

134 0 M>

135 0 SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Average Variance Extracted\SPSS_Output\sav\average-variance-extracted_spss_ready_data.sav' /COMPRESSED.

135 0 M> SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\Average Variance Extracted\SPSS_Output\sav\average-variance-extracted_spss_ready_data.sav' /COMPRESSED.

136 0

136 0 M>

137 0 ECHO '=====

137 0 M> ECHO '=====

=====

138 0 ECHO 'AVERAGE VARIANCE EXTRACTED'.

138 0 M> ECHO 'AVERAGE VARIANCE EXTRACTED'.

AVERAGE VARIANCE EXTRACTED

139 0 ECHO 'Design: Construct-specific convergent variance captured by standardized CFA loadings.'.

Average Variance Extracted
Construct-specific squared-loading and uniqueness evidence

```
139 0 M> ECHO 'Design: Construct-specific convergent variance captured by s
tandardized CFA loadings.'.
Design: Construct-specific convergent variance captured by standardized CFA lo
adings.
140 0 ECHO 'Null hypothesis: AVE is at or below .50 for a construct.'.
140 0 M> ECHO 'Null hypothesis: AVE is at or below .50 for a construct.'.
Null hypothesis: AVE is at or below .50 for a construct.
141 0 ECHO 'Formula: AVE=sum(lambda_i^2)/[sum(lambda_i^2)+sum(theta_i)].'.
141 0 M> ECHO 'Formula: AVE=sum(lambda_i^2)/[sum(lambda_i^2)+sum(theta_i)].
.'.
Formula: AVE=sum(lambda_i^2)/[sum(lambda_i^2)+sum(theta_i)].
142 0 ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
142 0 M> ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
Variables: G1, G2, G3, famrel, freetime, goout
143 0 ECHO 'Rows analyzed: 649'.
143 0 M> ECHO 'Rows analyzed: 649'.
Rows analyzed: 649
144 0 ECHO 'academic_ave = 0.8724853483046293'.
144 0 M> ECHO 'academic_ave = 0.8724853483046293'.
academic_ave = 0.8724853483046293
145 0 ECHO 'constructs = 2'.
145 0 M> ECHO 'constructs = 2'.
constructs = 2
146 0 ECHO 'minimum_ave = 0.26809760378634656'.
146 0 M> ECHO 'minimum_ave = 0.26809760378634656'.
minimum_ave = 0.26809760378634656
147 0 ECHO 'social_ave = 0.26809760378634656'.
147 0 M> ECHO 'social_ave = 0.26809760378634656'.
social_ave = 0.26809760378634656
148 0 ECHO 'Cross-check status: pass'.
148 0 M> ECHO 'Cross-check status: pass'.
Cross-check status: pass
149 0 ECHO '=====
====='.
149 0 M> ECHO '=====
=====
=====
====='.
150 0
150 0 M>
```

Average Variance Extracted
Construct-specific squared-loading and uniqueness evidence

```
151  0  OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and
Scale Testing\Average Variance Extracted\SPSS_Output\spv\average-variance-extracted_spss_output.spv'.
151  0 M> OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis a
nd Scale Testing\Average Variance Extracted\SPSS_Outpu
t\spv\average-variance-extracted_spss_output.spv'.
152  0  OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING
152  0 M> OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=
PRINTSETTING
```