

```
223 0 OUTPUT ACTIVATE CFIOutput.  
223 0 M> OUTPUT ACTIVATE CFIOutput.  
224 0 TITLE 'Comparative Fit Index'.  
224 0 M> TITLE 'Comparative Fit Index'.
```

Comparative Fit Index

```

225 0
225 0 M>
226 0 GET DATA
226 0 M> GET DATA
227 0 /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\CFI\dataset.csv' /ENCODING='UTF8' /DELCA=
      LINE /DELIMITERS=', ' /QUALIFIER='"'
227 0 M> /TYPE=TXT /FILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\CFI\dataset.csv' /ENCODING='UTF8' /DELCA=
      SE=LINE /DELIMITERS=', ' /QUALIFIER='"'
228 0 /ARRANGEMENT=DELIMITED /FIRSTCASE=2
228 0 M> /ARRANGEMENT=DELIMITED /FIRSTCASE=2
229 0 /VARIABLES=
229 0 M> /VARIABLES=
230 0 school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0 Fedu F8.0
230 0 M> school A8 sex A8 age F8.0 address A8 famsize A8 Pstatus A8 Medu F8.0 Fedu F8.0
231 0 Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime F8.0 failures F8.0
231 0 M> Mjob A16 Fjob A16 reason A16 guardian A16 traveltime F8.0 studytime F8.0 failures F8.0
232 0 schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 internet A8 romantic A8
232 0 M> schoolsup A8 famsup A8 paid A8 activities A8 nursery A8 higher A8 internet A8 romantic A8
233 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.
233 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.
234 0 DATASET NAME CFIData.
234 0 M> DATASET NAME CFIData.
235 0 COMPUTE subject_id=$CASENUM.
235 0 M> COMPUTE subject_id=$CASENUM.
236 0 COMPUTE Dalc_R=6-Dalc.
236 0 M> COMPUTE Dalc_R=6-Dalc.
237 0 COMPUTE Walc_R=6-Walc.
237 0 M> COMPUTE Walc_R=6-Walc.

```

Comparative Fit Index

```
238 0 RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
238 0 M> RECODE schoolsup famsup paid activities higher internet ('no'=0) ('yes'=1)
239 0 INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b.
239 0 M> INTO schoolsup_b famsup_b paid_b activities_b higher_b internet_b
.
240 0 EXECUTE.
240 0 M> EXECUTE.
241 0
241 0 M>
242 0 * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
242 0 M> * BEGIN METHOD-SPECIFIC SPSS WORKFLOW.
243 0 TITLE 'Comparative Fit Index'.
243 0 M> TITLE 'Comparative Fit Index'.
```

Comparative Fit Index

```
244 0 SUBTITLE 'Target two-factor model versus independence baseline'.
```

```
244 0 M> SUBTITLE 'Target two-factor model versus independence baseline'.
```

Comparative Fit Index
Target two-factor model versus independence baseline

```

245  0  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE /A
NALYSIS=G1 G2 G3 famrel freetime goout
245  0 M>  FACTOR /VARIABLES=G1 G2 G3 famrel freetime goout /MISSING=LISTWISE
/ANALYSIS=G1 G2 G3 famrel freetime goout
246  0    /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN
246  0 M>    /PRINT=INITIAL EXTRACTION KMO CORRELATION /PLOT=EIGEN
247  0    /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PAF /ROTATION=NOROTATE
/METHOD=CORRELATION.
247  0 M>    /CRITERIA=FACTORS(2) ITERATE(500) /EXTRACTION=PAF /ROTATION=NOROT
ATE /METHOD=CORRELATION.

```

Factor Analysis

Notes

Output Created		18-JUL-2026 10:54:10
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\CFI\dataset.csv
	Active Dataset	CFIData
	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.

Comparative Fit Index
Target two-factor model versus independence baseline

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	00:00:01.67
	Elapsed Time	00:00:01.11
	Maximum Memory Required	5704 (5.570K) bytes

[CFIData]

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

Comparative Fit Index
Target two-factor model versus independence baseline

Communalities

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

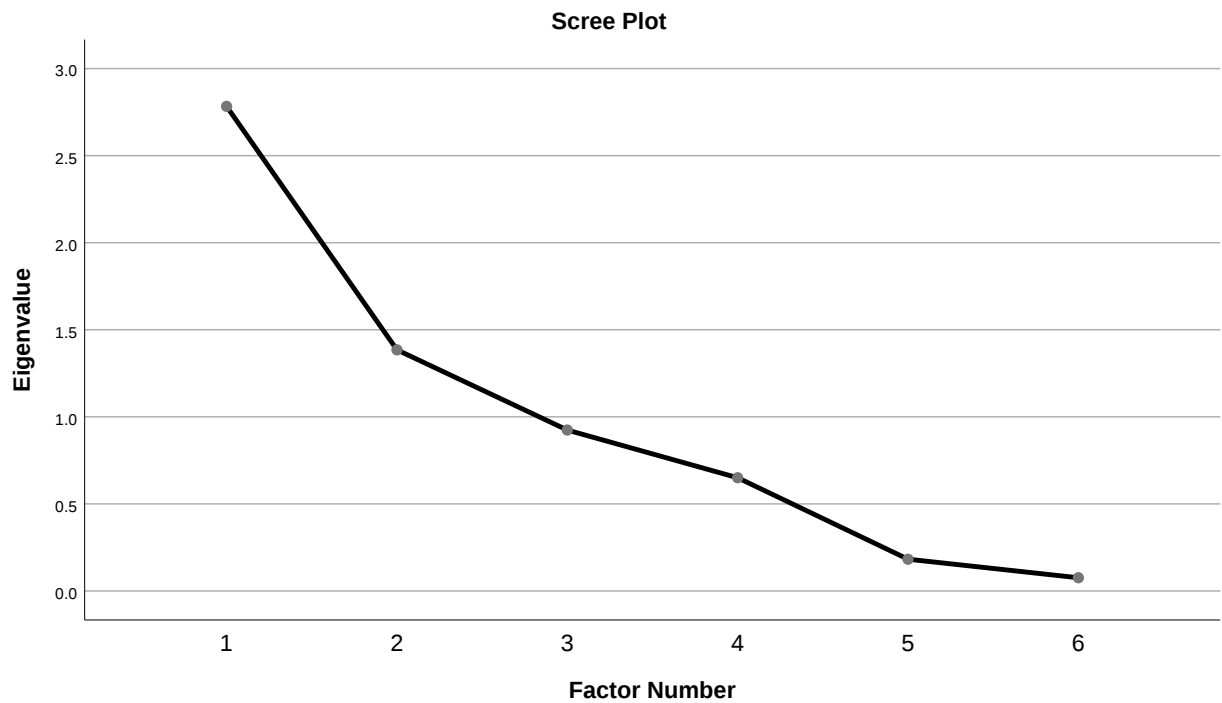
Extraction Method: Principal Axis Factoring.

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.

Comparative Fit Index
Target two-factor model versus independence baseline



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.

```
248 0 RELIABILITY /VARIABLES=G1 G2 G3 /SCALE('Academic measurement block')
ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE CORR.
248 0 M> RELIABILITY /VARIABLES=G1 G2 G3 /SCALE('Academic measurement block
') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE CORR
```

Comparative Fit Index
Target two-factor model versus independence baseline

Reliability

Notes

Output Created		18-JUL-2026 10:54:11
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\CFI\dataset.csv
	Active Dataset	CFIData
	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\CFI\cfi_spss_synt ax.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	00:00:00.03
	Elapsed Time	00:00:00.03

Scale: Academic measurement block

Comparative Fit Index
Target two-factor model versus independence baseline

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

```
249 0 RELIABILITY /VARIABLES=famrel freetime goout /SCALE('Social measureme
nt block') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SC
ALE CORR.
```

Comparative Fit Index
Target two-factor model versus independence baseline

```
249 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 10:54:11
Comments		
Input	Data	D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\CFI\dataset.csv
	Active Dataset	CFIData
	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\CFI\cfi_spss_synt ax.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=famrel freetime goout /SCALE ('Social measurement block') ALL /MODEL=ALPHA /STATISTICS=DESCRIPT IVE SCALE CORR.
Resources	Processor Time	00:00:00.05
	Elapsed Time	00:00:00.04

Comparative Fit Index
Target two-factor model versus independence baseline

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

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

Comparative Fit Index
Target two-factor model versus independence baseline

```
250 0 ECHO 'CFI compares noncentrality after subtracting model degrees of freedom'.
250 0 M> ECHO 'CFI compares noncentrality after subtracting model degrees of freedom'.
CFI compares noncentrality after subtracting model degrees of freedom
251 0 * END METHOD-SPECIFIC SPSS WORKFLOW.
251 0 M> * END METHOD-SPECIFIC SPSS WORKFLOW.
252 0
252 0 M>
253 0 SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\CFI\SPSS_Output\sav\cfi_spss_ready_data.sav' /COMPRESSED.
253 0 M> SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and Scale Testing\CFI\SPSS_Output\sav\cfi_spss_ready_data.sav' /COMPRESSED.
254 0
254 0 M>
255 0 ECHO '=====
====='.
255 0 M> ECHO '=====
====='.
=====
256 0 ECHO 'COMPARATIVE FIT INDEX'.
256 0 M> ECHO 'COMPARATIVE FIT INDEX'.
COMPARATIVE FIT INDEX
257 0 ECHO 'Design: Incremental CFA fit relative to an independence baseline model.'.
257 0 M> ECHO 'Design: Incremental CFA fit relative to an independence baseline model.'.
Design: Incremental CFA fit relative to an independence baseline model.
258 0 ECHO 'Null hypothesis: The target model does not improve noncentral fit over the independence model.'.
258 0 M> ECHO 'Null hypothesis: The target model does not improve noncentral fit over the independence model.'.
Null hypothesis: The target model does not improve noncentral fit over the independence model.
259 0 ECHO 'Formula: CFI=1-max(chi2-df,0)/max(chi2-df,chi2_b-df_b,0)'.
259 0 M> ECHO 'Formula: CFI=1-max(chi2-df,0)/max(chi2-df,chi2_b-df_b,0)'.
Formula: CFI=1-max(chi2-df,0)/max(chi2-df,chi2_b-df_b,0).
```

Comparative Fit Index
Target two-factor model versus independence baseline

```
260 0 ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
260 0 M> ECHO 'Variables: G1, G2, G3, famrel, freetime, goout'.
Variables: G1, G2, G3, famrel, freetime, goout
261 0 ECHO 'Rows analyzed: 649'.
261 0 M> ECHO 'Rows analyzed: 649'.
Rows analyzed: 649
262 0 ECHO 'baseline_chi_square = 2230.3839347203802'.
262 0 M> ECHO 'baseline_chi_square = 2230.3839347203802'.
baseline_chi_square = 2230.3839347203802
263 0 ECHO 'baseline_df = 15'.
263 0 M> ECHO 'baseline_df = 15'.
baseline_df = 15
264 0 ECHO 'cfi = 0.9973982062491278'.
264 0 M> ECHO 'cfi = 0.9973982062491278'.
cfi = 0.9973982062491278
265 0 ECHO 'target_chi_square = 13.76397207713822'.
265 0 M> ECHO 'target_chi_square = 13.76397207713822'.
target_chi_square = 13.76397207713822
266 0 ECHO 'target_df = 8'.
266 0 M> ECHO 'target_df = 8'.
target_df = 8
267 0 ECHO 'Cross-check status: pass'.
267 0 M> ECHO 'Cross-check status: pass'.
Cross-check status: pass
268 0 ECHO '=====
====='.
268 0 M> ECHO '=====
====='.
=====
269 0
269 0 M>
270 0 OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis and
Scale Testing\CFI\SPSS_Output\spv\cfi_spss_output.spv'
.
270 0 M> OUTPUT SAVE OUTFILE='D:\DATA ANALYSIS\L Validity Factor Analysis a
nd Scale Testing\CFI\SPSS_Output\spv\cfi_spss_output.s
pv'.
271 0 OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRI
NTSETTING
```

Comparative Fit Index
Target two-factor model versus independence baseline

```
271 0 M> OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=  
PRINTSETTING
```